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OF

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VOL. III.



THE
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OF
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EDITED BY
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SECRETARY OF THE AS. SOC., AND HON. MEM. OF THE AS. SOC. OF PARIS.

VOL. III.

JANUARY TO DECEMBER,
1834.

“It will flourish, if naturalists, chemists, antiquaries, philologists, and men of science, in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta; it will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease.”

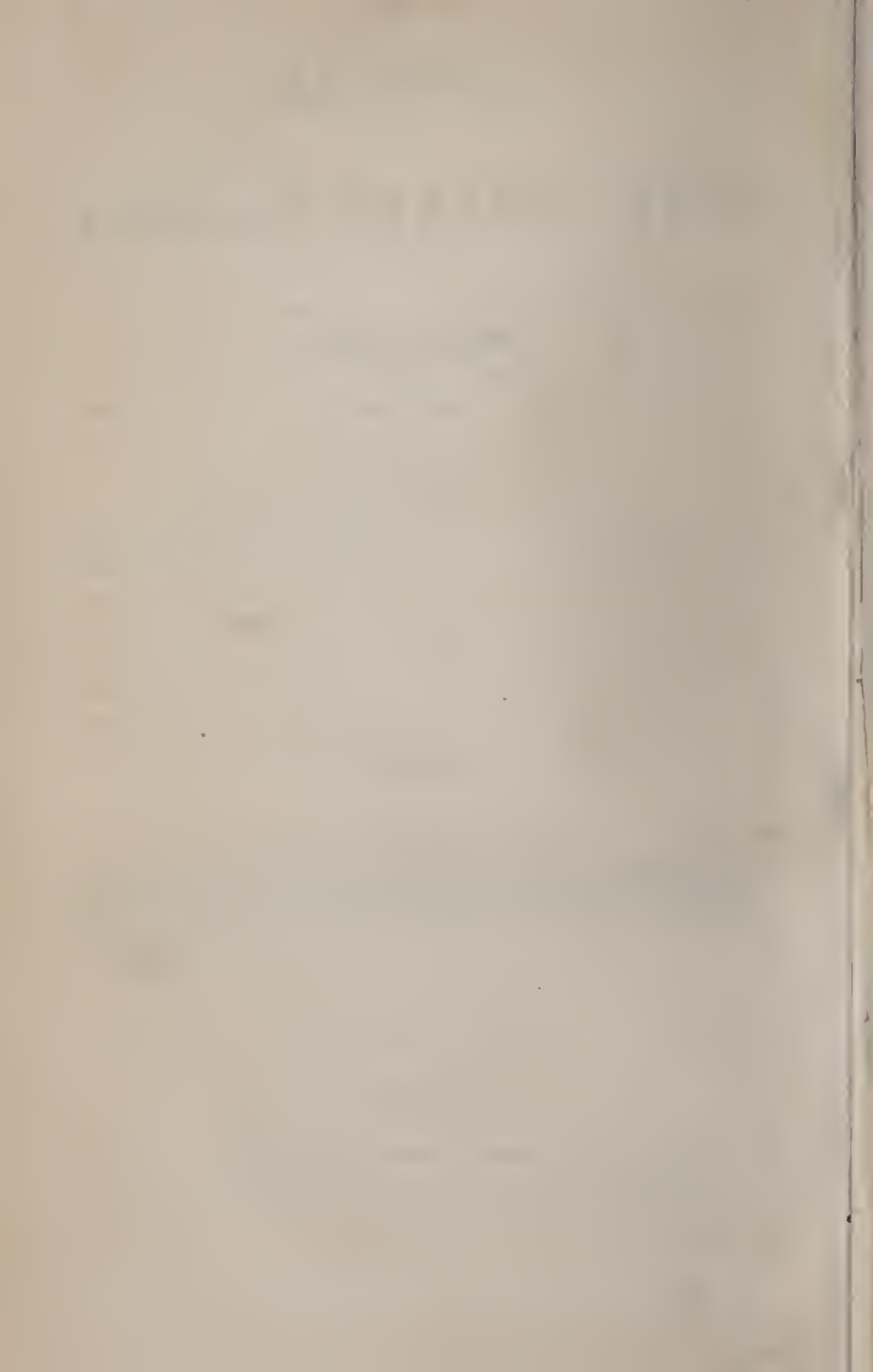
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PREFACE.



THE third volume of the JOURNAL OF THE ASIATIC SOCIETY would not have required a preface, had not the observations made by the Editor, on publishing the second volume, implied that the subscribers and supporters of the work should be made acquainted with its progress in a financial point of view, especially after the diminution of support which the order regarding postage, taking effect on the 1st June last, was calculated to produce. The Editor is however happy to announce that his friends and the public have not allowed this circumstance materially to affect their support. The circulation is now nearly as great as it was, not more than 30 names having been withdrawn in consequence of the postage regulations ; while other names have been added to the subscription list, probably from a feeling of interest, lest the work should succumb to circumstances of discouragement. Some reductions were liberally allowed in the printing charges by the Press which has from the first been employed in publishing the work (and in a manner highly creditable to the Baptist Missionary Establishment), so that the expences this year, notwithstanding the increase of the number of plates to thirty-six, have not much exceeded the income. It is unnecessary to enter into particulars, as the statement published last year will, with the aid of the list of subscribers, furnish an near as estimate as it is possible to give on the result of the year's operations.

The Editor cannot refrain from making known to his correspondents the great interest which has been excited in Europe by many of the papers which they have done him the honor to contribute. The letters he has received from Oxford, London, and Paris would alone be sufficient to urge him to a continuance of his Editorial labours, did he not feel, unconnected with praise or censure, that the Journal was now become a necessary adjunct of the Asiatic Society, and that it continues to receive an unin-

mitted supply of valuable papers and memoirs which there would now be a degree of culpability in withholding from immediate publication!

The tenor of the chief publications of the past year has been turned aside from the objects of natural science to which it was supposed future Indian researches would principally be confined, by a train of antiquarian discovery of an unexpected and highly interesting nature in the classical field of ancient Bactriana. Every endeavour has been made to bring to notice the novelties and facts, as they have been discovered; and this has in some cases caused confusion in the recital, imperfect investigation, and some contradiction in results too hastily announced. It is hoped, however, that these inconveniences, incident to a periodical appearing at short intervals, will be more than counterbalanced by the speedy and faithful publication of the circumstances as they have been brought to light. The Index will serve in some degree to connect the detached notices of one subject into a continuous narrative. Thus, the present volume comprises all that has been hitherto discovered in the various topes of Manikyála. Much however remains to be brought to notice regarding the Bactrian coins, and what has been learnt from the specimens furnished by Dr. GERARD, and by SHEKH KERAMAT ALI, has been purposely kept back to be incorporated with the facts developed by the collection of General VENTURA, now on its way to France under charge of the Chevalier ALLARD.

Of inscriptions and antiquities, more purely Indian, the present volume furnishes an abundant store; nor have they been withheld until interpretations could be furnished. Every care has been taken to render the plates accurate, and extra copies have in all cases been struck off for circulation where aid may be expected in decyphering them.

If the past year has been fortunate in antiquarian research, it has also been eminently so in fossil geology. The several notices in the Proceedings of the Society will bear out this assertion. Besides further discoveries in the Nerbada valley, a new fossil field has been opened in the Sewálik range of the Himálaya, and already museums are being filled with its gigantic spoils.

Several geographical notices in this volume will be read with interest; and none more so than the extract from an Arabic

work on the Navigation of the Indian Ocean by the illustrious VON HAMMER of Vienna. The seasons and the modes of reckoning set forth in the *Mohit* are still followed by the Arab navigators who frequent the port of Calcutta; the Editor in passing the article through the press derived much information from some of the *Nakodas*, who recognized and pointed out almost all the places enumerated in the Arabic work.

If the existence of the Journal has in any way promoted the acquirement or the preservation of any of the knowledge which its pages boast of containing, the Editor is fully rewarded for the labour, and for the sacrifice of time that has necessarily been demanded in more than an ordinary measure, where correspondence, arrangement, correction of the press, and publication have fallen on one individual, who has had moreover only the hours of leisure and recreation to devote to the purpose.

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ERRATA.

In the December Number of the Second Volume.

Page 654, *dele* Note.

655, line 11, *for* '514dth' *read* '514dth.'

15, *for* 'X (572,300)² &c.' *read* '÷ (572,300)² × by $\frac{52.9}{1609}$ '

3, from bottom, *for* '÷' *read* '÷.'

659, 32, *for* 'W. Burt' *read* 'T. S. Burt.'

In the Present Volume.

ص سطر غلط	ص سطر غلط	ص سطر غلط	ص سطر غلط
صحيح	صحيح	صحيح	صحيح
١٢ ٤	السلطنة السلطنة	١٤ ٣	بقعها بقعه
١٢ ٥	هشتاد و هشتاد و در	١٤ ٣	ثدای ثدائی
١٣ ١	طبيه طيب	١٤ ٤	زایر زائر
١٣ ١	و تعالی تعالی	١٤ ٤	رضای رضائی
١٣ ١	مشواه مشواه	١٤ ٦	ثقبل ثقیل
١٣ ٥	هوشیاری هشیاری	١٤ ٩	ودر و در
١٣ ٦	ملایک ملائک	١٤ ١٠	جرعه جرعه
١٤ ١	حمل جمیل	١٧ ١	عظم عظم
١٤ ٢	يقع بقیع	١٧ ١	مانده مانده
١٤ ٢	قبوض فیوض		

Page 53, 39, *for* 'granity,' *read* 'granite.'

58, last line of Tibetan, *for* གྲིང *read* ཡྲིང

61, line 3, of ditto, 2nd Stanza, *for* རྩང་ལྷ་མོ་ *read* རྩང་ལྷ་མོ་

111, 30, *for* '178,' *read* '278.'

226, Note, *for* 'svasú' *read* 'svasrú'

251, 4, from top, before 'astronomy,' insert 'on.'

— 18, from foot, *for* 'Hercules,' *read* 'λ Herculis.'

Page 252, line 7, from top, *for* 'simi,' *read* 'semi.'

— 13, from top, *for* 'attractions,' *read* 'attraction.'

— 8, from foot, (note) *for* 'in,' *read* 'on.'

253, 7, from top, *for* 'extinction,' *read* 'extrication.'

— 12, from foot, *for* 'to have,' *read* 'we have.'

— 9, from foot, place the comma *before* 'has.'

254, 8, from top, *for* 'monogram,' *read* 'monograph.'

— 18, from foot, *for* 'greater comparatively,' *read* 'comparatively greater.'

— 17, from foot, *for* 'heat-conducting probable,' *read* 'probable heat-conducting.'

255, 1, *for* 'Phlegræn,' *read* 'Phlegræan.'

— 16, from top, *for* 'precipices,' *read* 'precipitous.'

— 18, from foot, *for* 'of,' *read* 'at.'

In the Latin interlineation of the column 1. 12, in the large Devanágari plate, *for* 'Magnatis,' *read* 'Magni.'

310, 1, *for* 'for,' *read* 'from.'

313, 10, *for* 'near Kabul' *read* 'in the *Punjab*, lat. 32° long. 72° east of Paris.'

315, 25, *for* 'mass,' *read* 'chamber.'

367, 24, *for* 'seer' *read* *falús* (or *pice*)=282 grs. troy.

378, in the General Table, *for* 'Timúchir,' *read* 'Timutchin.'

405, line 17, *for* '3° 0' 0", ' *read* '0° 0' 0".'

409, in column headed Saugur, *for* '12 18,' *read* '11 18.'

443, line 9, *for* '10 and 11' *read* '9 and 10.'

10, *for* 'own,' *read* 'now.'

447, 37, *after* FARNAVIZ, *insert* (*fard-navis*, record-writer.)

450, last line, *for* 'Larikhara,' *read* 'Lashkhara.'

452, 14, *for* MIOPA *read* MIOPA.

498, 21, the 19th character, **ل** should be **ل** like the one immediately preceding it.

560, line 34, *for* 'cross,' *read* 'crop.'

593, 4, *for* 'univalve,' *read* 'bivalve.'

ADDENDUM.

Page 450, line 10, *insert as a foot note*, * Dr. J. Swincy has pointed out to me the following passage in the "*Analecta Antiquitatum et Consuetudinum Persicarum*," contained in a work entitled, "*Asia*, by BAPTISTA GRAMAYE," page 377.

"*Dianam Persicâ voce NANNEAM vocabant, et certis mysteriis colebant.*"

This is precisely the word on the reverse of the Kanerkos coin, and would prove the figure to represent the moon, a very probable circumstance, as some coins since discovered place her in direct connection with Mithra, the sun. It also readily accounts for the word *Mao*, on numerous coins of the same class, that being doubtless the Zend for *Mas* (Sunsrit) and *Mah* (Persian), the moon.—J. P.

[For Directions to the Binder see the last page of the volume.]

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 25.—January, 1834.

I.—*Professor Schlegel's Enigma.—Mode of expressing numerals in the Sanskrit and Tibetan languages.*

AT the end of the pamphlet lately addressed by Professor SCHLEGEL to Sir JAMES MACKINTOSH, on the subject of the Oriental Translation Committee of the Royal Asiatic Society*, we find a morçeau of enlightenment for the continental orientalists, on the Hindú method of expressing numerals by symbolical words, which the learned author states himself to be the first to expound to European scholars.

It is certainly a curious circumstance that neither COLEBROOKE, DAVIS, nor BENTLEY, when quoting, translating, and commenting on the text of Sanskrit astronomical works, should have taken occasion to explain the system invariably used by their authors in expressing verbally the numbers occurring in their computations and formulæ; it must doubtless be attributed to their considering the subject too trite and obvious to need any remark, or otherwise the very passage quoted by Professor SCHLEGEL would surely have elicited some observation by the translator. It is true however that many of the terms thus technically adopted by the Sanskrit arithmeticians and astronomers, as the only mode perhaps of screwing the uncouth elements they had to deal with into the procrus-

* This pamphlet contains also an attack upon Dr. H. H. WILSON, which that gentleman will doubtless answer for himself, and some severe criticism on the careless manner in which oriental works are issued from the press by Calcutta Editors generally. We trust our Orientalists will be able to shew that such censure is not deserved, or at any rate that it applies but partially; and we should like to have the opportunity of pointing out those works (such as the Sháh náma) to the accuracy of which real editorial care was devoted, and on which the confidence of the reader may be implicitly placed.—ED.

tean bed of poetical metre, are not to be found in the best dictionaries ; for instance, *veda*, for 4 ; *ananta* for 0 ; *Rudra* for 7 ; while on the other hand many, such as ॐ, for zero ; *vasu*, for 8, &c. will be found in WILSON'S last edition.

I extract the Professor's remarks at length, since equal credit is due to his ingenuity in unravelling the mystery, in the absence of native pundits, who would have cleared it up in a moment, as if it had altogether been a sealed book of hieroglyphics to the more fortunate student on this side the water, as to the rising schools of Sanskrit philosophy in Germany and France.

Explication d'une Enigme.

“ Dans les Recherches Asiatiques, vol. xii. p. 231, M. COLEBROOKE cite un auteur qui dit que le nombre des jours sidéraux compris dans la grande époque, appelée *Calpa*, est : 1,582,236,450,000. Il donne le texte même, dont les mots qui répondent à ce nombre, signifient littéralement : quatre espaces vides (ou zero), cinq, *vêda*, goût, feu, jumeaux, aîle, huit, flèche, lune. Tout ces mots sont réunis en un seul composé agrégatif.

Qu'on se figure maintenant l'embarras des écoliers interpellés pour expliquer comment cette bigarrure fait précisément un trillion cinq cents quatre-vingt-deux billions, deux cents trente six millions, et quatre cents cinquante mille. La chose est pourtant bien sûre : il ne peut y avoir erreur. Voici le mot de l'enigme. Les mathématiciens Indiens ont une méthode d'exprimer les chiffres par des noms restreints à un certain nombre d'objets. Ils commencent à la droite par les unités, et remontent vers les chiffres d'un ordre supérieur. Cela a l'air d'une puérilité, il y a pourtant là-dessous un but raisonnable. Ou a voulu se prémunir contre l'altération des chiffres qui se glisse si facilement dans les livres copiés à la main. Quand le traité était rédigé en vers, comme c'est un ancien usage dans l'Inde d'employer la versification même dans les livres scientifiques, la garantie en devenait d'autant plus forte.

Voici l'explication. Les deux premiers termes, étant des chiffres sans déguisement, n'en ont besoin. *Vêda* ; ces livres sacrés sont au nombre de quatre. *Goût* : on en compte six espèces principales : le doux, l'amer, le salé, l'aigre, le poignant et l'astringent. *Feu* signifie trois ; par rapport aux trois feux sacrés que les brahmanes entretiennent. *Jumeaux*, *aîle*, signifient naturellement deux ; le dernier mot est employé aussi pour les deux moitiés d'une lunaison. *Flèche* signifie cinq : ce sont les cinq flèches du dieu de l'amour, dont les pointes sont armées de fleurs. Ces flèches sont un emblème des cinq sens par lesquels l'amour pénètre dans l'âme. *Lune* est un, parcequ'il n'y a qu'une seule lune.

On voit cependant qu'il y a là dedans quelque chose de conventionnel. Par exemple, le mot de goût, chez les Indiens comme chez nous, est employé aussi métaphoriquement, pour les différentes impressions que produit la poésie. Alors l'énumération varie de huit à dix. Il faut donc savoir que, lorsque ce mot est substitué à un chiffre, l'on doit entendre le goût matériel.

Un autre auteur cité par M. COLEBROKE, exprime le même nombre de la manière suivante, &c.”

The only difference in the second enumeration quoted by the Professor consists in the substitution of *ocean*, *quality*, *vasu*, and *lunar day*, for 4, 3, 8 and 15, respectively: of which *vasu* alone requires explanation, being the name of a species of inferior divinities, eight in number.

The astronomical pundit of the Sanskrit College has enabled me to publish a catalogue of the principal terms thus numerically employed in the *Surya-siddhānta*, the *Arya-siddhānta*, the *Bhāsvatī*, and the other numerous astronomical works of the Hindús. It does not seem necessary to offer any explanation, beyond a simple translation of the terms, since in most cases their origin is obvious to such as are acquainted with the metaphysical or mythological systems of the Hindús. The only equivocal expression in the list appears to be *समुद्र*, *ocean*, which may either represent *four* or *seven*: but it is invariably employed in the former sense in the *Surya-Siddhanta* and other best authorities.

The mode of expressing any number greater than nine is, by placing consecutively the term for each figure, beginning with the lowest or right-hand figure, as will readily be understood from the example quoted by Professor SCHLEGEL; and as there are numerous synonymes of most of the simple terms, which may be selected as they may be the best adapted to the metre of the intended *aslok*, an infinity of compounds may be thus formed which must be perplexing enough to a student, in addition to all the other difficulties of a science of calculations. For a few compounds, however, as 11, 12, 15, 32, &c. single expressions have been created, founded on the names of Siva, the signs of the zodiac, the days in a half-lunation, the number of human teeth, and other similar analogies, that are easily retained in the memory.

The following is the list alluded to, omitting most of the synonymes of each word, which would have swelled it to an inconvenient length.

- ० or 0. ख *kha*; vacuity, अनन्त, आकाश &c. space, heaven, zero, cypher.
 १ or 1. पृथ्वी *prithvī*; the earth, (and its synonymes भूमि, भू, कु &c.)
 चन्द्र *chandra*; the moon, (चन्द्रमा, इन्दु, हिमांशु, &c.)
 रूप *rūp*; form, colour, &c.
 २ or 2. पक्ष *paksh*; a wing, the half of a lunar month,
 नेत्र *nétra*; the eye, (नयन, चक्षु, अक्षि, &c.)
 भुज *bhuja*; an arm, (वाङ्ग, दोस्, &c.)
 यम *yam*; twin, also the deity of *Naraka* or hell.
 अश्विन् *ashwina*; the twin sons of *Surya*.
 छद् *chhada*; jaw, (the two jaws.)
 ३ or 3. बन्धि *bhanhi*; fire, (अग्नि, and its synonymes.)
 राम *Rāma*, the deity *Rāma*; (the three are *Rāma*, *Balarāma*,
 and *Parasurama*.)

- पिनाकनयन *Pinákanayana* ; a name of *Siva*, (*trilochan*, 3-eyed.)
 गुण *guna* ; the three qualities, good, middling, and bad.
- ५ or 4. वेद *Veda* ; the four *Védas*, (and their synonymes.)
 अब्धि *abdhi* ; an ocean, (समुद्र सिन्धु, &c.) N. E. S. and W. seas.
 कृत *Krita* ; the first of the four ages of the world.
 युग *Yuga*, an age, as the preceding.
 जल *jala* ; water, वारि, नीर, &c. (similar to ocean.)
- ५ or 5. बाण *ván* ; an arrow, (and its synonymes.)
 प्राण *prán* ; inspiration, the five modes of vital inspiration.
- ६ or 6. अङ्ग *anga* ; the members (head, arms, legs, and body.)
 रस *rasa* ; taste, the six savours.
 राग *rága* ; mode of music (the six Hindu musical modes.)
 ऋतु *ritu* ; the six seasons according to the Hindu division.
 तर्क *tark* ; *Shastra* : the six *Shástras*.
 अरि *ari* ; the enemy, the six dangers, or temptations.
- ७ or 7. मुनि *Muni*, a saint, sage, (and its synonymes ऋषि, &c.)
 स्वर *swara* ; vowel, the six vowels.
 नग *naga* ; a mountain, अचल, पर्वत and other synonymes. .
 अश्व *ashwa* ; a horse, (the 7-faced horse of *SURYA*.)
 समुद्र *samudra* ; an ocean, the seven encircling seas*.
- ८ or 8. वसु *Vasu* ; the eight demigods so called.
 गज *gaj* ; an elephant (and its synonymes.) Eight elephants support the eight *Dishás*, or cardinal points.
 नाग *nága* ; a serpent ; the eight species of snakes.
 मङ्गल *mangala*, happiness, good fortune.
- ९ or 9. अङ्क *anka* ; a numeral : the nine units from 1 to 9.
 छिद्र *chhidra* ; an inlet, (the nine orifices of the body.)
 ग्रह *graha* ; a planet, (the 7 planets and two lunar nodes.)
- १० or 10. दिश *dishá* ; a side, quarter, (and its synonymes,) the eight cardinal points, with the zenith and nadir. For this and all numbers composed of two or more figures other compound expressions may be formed, as खभू. खचन्द्र cypher-earth cypher-moon, meaning *zero*, *one*, or *10*, as explained in the foregoing remarks : the following numbers however have simple expressions likewise.
- ११ or 11. ईश *Isha* ; a name of *Rudra* or *Siva*, (and his other 11 names.)
- १२ or 12. सूर्य *Súrya* ; the sun, (from his 12 monthly appellations.)
 चक्र *chakra* ; a wheel, the zodiac.
- १३ or 13. विश्व *Vishva* ; the universe, (the 14 *bhuvanas*, deducting *baikunt* on *Vishnú's* heaven); see the next number.
 काम *Káma* ; Cupid; the *Swámí* or lord of the 13th *tithí* or lunar day.

* Only used in the *Granthas* of South India.

- १४ or 14. भुवन *bhuwana* ; the world, or universe : the seven upper and seven lower heavens.
इन्द्र *Indra*, a name of the god Indra, (renewed at fourteen epochs.)
मनु *Manu* ; the fourteen munis, or saints.
- १५ or 15. तिथि *tithi* ; a lunar day, (fifteen in a semilunation.)
अह *aha* ; a day, (from the same analogy.)
- १६ or 16. कला *kalā* ; a digit, one-sixteenth of the moon's diameter.
अष्टि *akhri* ; a metre, consisting of four lines, having sixteen syllables in each.
रूप *uripa* ; a king, (and its synonymes, from the tale of the 16 rajās in the *Mahābhārat*.)
- १७ or 17. अत्यष्टि *atyakhri* ; a stanza of four lines, with seventeen syllables to the line.
- १८ or 18. धृति *dhriti* ; ditto having eighteen syllables in a line.
- १९ or 19. अतिधृति *atidhriti*, ditto with nineteen syllables in each line.
- २० or 20. नख *nakh* ; a finger nail.
- २१ or 21. स्वर्ग *Swerga* ; heaven. The twenty one heavens.
- २२ or 22. जाति *Jāti*, kind, sort ; race, family, cast.
- २४ or 24. जिन *Jina* ; the 24 Jinas of the Buddhist religion.
- २५ or 25. तत्त्व *tatwa* ; the 25 essences : the five quintuple elements.
- २६ or 26. उत्कृति *utkriti* ; in prosody, a stanza of four lines of twenty-six syllables each.
- २७ or 27. भ or नक्षत्र *nakshatra* ; a star, the 27 lunar mansions.
- ३२ or 32. दन्त *danta* ; a tooth, the number of human teeth.
- ३३ or 33. देव *Deva*, a god, for the 33 crores of Hindu gods ; or by other accounts, 11 Rudras, 12 Suryas, 8 Vasus, and 2 Viswadevas.
- ४९ or 49. तान *tāna* ; tune ; the seven octaves (of seven notes each.)
वायु *vāyu*, the air, the 7 vayus and their 7 subspecies.

On looking over Mr. A. CSOMA's manuscript translations and extracts from the Tibetan works in the Society's library, my attention was attracted to the passage in his life of SHAKYA, where the Tibetan author quotes the epoch of BUDDHA from a variety of different authorities : here the same numerical system is seen to prevail ;—the printed Tibetan text has the dates in figures above, and written at length in the body of the text, in the same kind of symbolical words, as if to secure them from the danger of alteration ; this system in fact gives the same safeguard against the incertitude of figures as the mode of writing values and sums at length in European documents is intended to secure. To elucidate the subject at the time, a separate note was drawn up by Mr. CSOMA, shewing that the symbolical terms employed by the Tibetan writers were chiefly if not entirely derived, like their literature in general, from Sans-

krit originals. I am happy in being permitted to take this opportunity of publishing the catalogue and notes of this indefatigable scholar, placing in juxtaposition the parallel expressions of the Sanskrit language, for the convenience of comparison with the catalogue just given of the terms usually employed in the latter tongue.

Tibetan Symbolical Names, used as Numerals.

“ In astronomy and astrology, there are many works to be found in Tibet, that have not been introduced into the *Kah-gyur* or *Stan-gyur* collections. Of these the most celebrated is the *Be'dúrya Kúrpo*, written by *s, D'-srid Sangs-r,gyas r, Gya-m, ts'ho* (པཎ་སྐྱིད་སངས་རྒྱལ་མཆོ་མཆོ་.) a regent or vice-roy at *Lhasa*, in the last half of the seventeenth century of our æra. In all these works, symbolical names (གངས་བཟོ་ *grangs br, da*, numerical signs), are used instead of numerals, in all arithmetical and astronomical calculations. As for instance : + ལྷག, for +2; —མེ, for —3; × རྩ, for × 4; ÷ རྩ, for ÷ 32.

This mode of expressing numbers has been borrowed from India by the Tibetans. For some of the numerals specified below, there are yet other synonymous terms applied in Tibetan, as in Sanskrit, but in their works these only are of general use. Although the nine units, together with the zero (o), would be sufficient to express any greater number, yet there are used the following numerals also : 10, 11, 12, 13, 14, 15, 16, 18, 24, 25, 27, and 32.

When dictating to an assistant in symbolical names what to write in characters, the pandit commences the operation from right to left : thus if he says གྱེ་མ (12), མཁའ (0), མཆོ་ (4), the other writes 4012, &c. This method is the same with that followed in the *Shastras* of India therefore it is unnecessary to add any thing further on the subject.

The following numbers are expressed by such names as are stated here below, and explained in English, to which the Sanskrit terms also have been added (with a few exceptions) not from Tibetan books, but from other sources :

୨ or 1. གཟུགས་, * *gzugs*, body ; S. *sharíram*.

ཟླ, *zla*, the moon ; S. *chandra*.

འོ་རྩ་དཀར, *hot-tkar*, white brightness, the moon : S. *shwéta-rochis*.

བསེ་རྩ, *bse-ru*, rhinoceros ; S. *gandaka*.

୨ or 2. ལྷག, *lag*, the hand : S. *bhuja*, *hasta*, or *pani*.

མིག, *mig*, the eye : S. *nétra*, *chakshus*.

* Note. The articles, དྲ, དོ, ད, དོ, མ, མོ, (Paṇo, Va, vo, ma mo, &c.) have been omitted after the roots, since the words occur mostly in this form.

- ཟུང་ཕྱེད་པ་, *zung-phyogs*, or simply ཟུང་, *zung*, the two sides,
 wings, halves, a pair, couple; S. *chhada*, *pakshó*, &c.
 འཁྲིག་ *hkhrig*, or བགྲོད་, *bgrod*, the twins; copulation :
 ༩ or 3. འཇིག་རྟེན་, *hjig-rtan*, the world; S. *loka*.
 ཡོན་ཏན་, *yon-tan*, quality; S. *guna*.
 མེ, *mé*, fire, S. *agni* or *anala*.
 རྩེ, *rtsé*, top, summit: S. *agram*.
 ༧ or 4. མཚེ, *mtsho*, a sea or lake: S. *samudra*.
 ཆུ, *chhu*, water; S. *jala* or *wari*.
 ཀང, *rkang*, a foot: S. *pàda*.
 རིག་བྱེད་, *Rig-byéd*, a Vèda; S. *Vèda*.
 ༥ or 5. འབྲུང་, *hbyung*, an element; S. *bhútam*.
 དབང་, *dvang*, an organ of sense; S. *indrayam*.
 མངའ་, *mdah*, an arrow: S. *bána* or *vána*.
 ཕུང་, *phung*, a heap of the aggregates constituting the body and
 soul; S. *skándha*.
 ༦ or 6. མཛམས་, *mtshams*, the six cardinal points: the north, east,
 south west, zenith and nadir.
 རྩེ་བྱ་བ་, *ro, bro-va*, taste, savour; S. *rasa*.
 དུས་, *dus*, time, season; S. *samaya*.
 ༧ or 7. ཐུབ་པ་, *Thub-pa*, a sage; S. *Muni*.
 རྩང་སྟོང་, *Drang-srong*, an hermit: S. *Rishi*.
 རི, *ri*, a hill or mountain; S. *parvata*.
 རིས་གཟུག་, *Res-gzah*, a special or chief planet; S. *Graha*.
 ༨ or 8. ཀླུ་, *klu*, an hydra or snake; S. *nága*.
 སྦྲུལ་, *sbrul*, serpent; S. *sarpa*.
 གདངས་པ་མཆོག་, *gdengs-chan*, a hooded-snake; S. ?
 ལྷོ་ལྷོ་, *lto-hgro*, creeping on its belly: S. *uraga*.
 རྣ་འཇིག་, *nor* or རྣ་འཇིག་, *nor-lha*, wealth, or the eight gods of wealth:
 S. *Vasu* or *vasudéva*.
 རྩེད་པ་, *sred-pa*, affection, passion: S. ?
 ༩ or 9. རྩ་, *rtsa*, root (or vein): S. *múla*.
 གཏེར་, *gter*, treasure; S. *kosham*.

གཟའ་, *gzah*, a planet ; S. *graha*.

བུ་ག, *bu-ga*, a hole, S. *chiddra*.

ལྷིན་པོ་, *Srín-po*, an imp or goblin ; S. *Rákshasa*.

༡༠ or 10. ལྷོ་གསུམ་, *phyogs*, corner, quarter, point: S. *Dik* or *Dish*. The ten points. 4 cardinal, 4 intermediate, the zenith and the nadir.)

༡༡ or 11. འཕྲོག་ཐེང་, *h.phrog-byed*, that takes by force ; S. *Hari* for *Siva*.

རྩལ་པོ་, *Drag-po*, the brave or fierce, S. *Rudra*, for *Siva*.

བདེ་འབྲུང་, *Bde-hbyung*, the source of happiness ; S. *Shambhu*, another name of *Siva*.

དབང་ཕྱུག་, *Dvang-phyug*, the powerful: S. *Ishwara*, for *Siva*.

༡༢ or 12. གྱི་མ་, *Nyí-ma*, the sun ; S. *Surya*, *Arka*, *Bhānu*.

ཁྱིམ་, *khyím*, the sun's place in the zodiac ; S. *Griha* or pl. *Grihás*, the 12 zodiacal signs.

༡༣ or 13. འདོད་པ་, *hdod-pa*, lust, desire, wish, Cupid ; S. *Kāma*.

ལྷོས་ཐེང་ or ལྷོས་ཐེང་, *nyos-byed*, that inebriates or makes mad, lust, desire, wish, Cupido. S. *Madana*, *Kāma Déva*.

༡༤ or 14. ཡིད་, *gid*, the mind ; S. *manas*.

མ་ལུ་, *Ma-nu*, ditto ; S. *manu*.

སྤྲིད་པ་, *Srid-pa*, existence, birth, the world ; S. *bhuvanam*.

༡༥ or 15. ཚེས་ཁིན་ཞག་, *tshes, nyin-zhag*, the 15th day of a lunar month ; any day of the semilunation. S. *Aha* or *Ahan*.

༡༦ or 16. མི་བདད་ག་, *Mi-bdag*, lord of men, a sovereign ; S. *Narapati*.

རྒྱལ་པོ་, *Rgyal-po*, a king; prince ; S. *Rāja*.

༡༨ or 18. རྟོག་པ་, ལྷོན་, *nyes-pa*, or *skyon*, vice, fault, blemish, S. *Dosha*.

༢༤ or 24. རྒྱལ་བ་, *Rgyal-va*, he that has been victorious, a Jina or Buddha ; S. *Jina*.

༢༥ or 25. དེ་ཉིད་, *de-nyid*, the same self ; S. *tatwam*.

or 27. སྐར་མ་, *Skar-ma*, a star, one of the 27 constellations in the path of the moon ; S. *Nakshatra*.

༣༢ or 32. སྟོ་, *So*, a tooth ; S. *danta*,

For 0 zero or 0 the following three terms are used :

མཁའ་, *mkhah*, void, space, S. *kha*, *ākāsha*, *gaganam*.

ཁྱིག་, *hig*, a spot, stain ; S. ? *nabhas*.

སྟངས་པ་, *Stong-pa*, the vacuum ; empty space, zero ; S. *shūnyam*

II.—*A Brief Description of Herat.* By Munshi Mohun Lal.

To the Editor of the Journal of the Asiatic Society.

SIR,

The arrival here lately of a package from India, bringing Journals of the Asiatic Society, of which you are the source, containing many curious novelties, has excited my desire to contribute some little information to so great a public object.

I was two years in the Dehli College, under the tuition of Mr. TAYLOR, and encouraged to gain the eternal advantage of learning by C. E. TREVELYAN, Esq. who is my kind patron.

At my friend Mr. B. FITZGERALD's house, I met Lieut. A. BURNES, whom I accompanied at his wish, and of my own free will, to *Bokhara* and Persia, in the capacity of a Persian Munshi. I am now in company with Dr. GERARD. We have only native articles of writing, and are also not in a place of solitude, or even of quiet repose, an account of the preparations for encountering SHAH SHUJA. I therefore hope you will be kind enough to forgive the feebleness of my observations, and the badness of my pen and paper, but I trust my endeavours in the accompanying will not be the less acceptable in describing a brief account of Herat.

I remain, &c.

Kandahar, 10th October, 1833.

MOHUN LAL.

The City of Herat.

Tradition and the following Persian verse say, that the foundation of the city of *Herát*, or *Hari*, was by an ancient king called LAHRASP, who was succeeded by GUSHTASP. ALEXANDER, the successor of BEHMAN, built and finished the structure of Herat very beautifully, and after him it was never repaired.

لهراسپ نهاده است هري را بنياد گشتاسپ براوندى ديگر بدهاد
بهمن پس ازان عمارتى ديگر كرد اسکندر رومى اش همه دان بداد

[Lahrâsp laid the foundations of Haré ; Gushtasprected many buildings thereon ; Bahman after him added greatly to the town, and Alexander put the finishing stroke to it.—]

The city is environed by a strong wall, and also by a small, weak, and thirsty ditch. The circumference is nearly four miles. The houses in the city are generally made of two stories high, and have very small doors to enter at.

Great part of the population of the city, and even of the western district, is *Parsi Baban*, the follower of *Panj-tan*, or five persons, namely, MUHAMMED, ALI, FATIMAH, HASAN, and HOSAIN.—They are all fond of the Persian government—not with regard to religion, but through the ill treatment, which they daily receive from KAMRAN and his ministers.

He is a decrepit and gloomy prince. He excites the pity of mankind. He has neither state nor good palace, which is like a prison. He is

destitute of the signs of royalty, and a ray of meanness and melancholy gleams on his features.

He is afraid of his ministers and of the whole Ala koo zay family, who over-rule him. He is anxious to get rid of them, and to be an ally of the English Government, of which he often talked very friendly.

SHAIR MUHAMMED KHAN, the Acting Vizier, is a talkative and base man. He suspected us to be Russian spies, and twice sent thieves at night to destroy us, but availed nothing.

Our abode in Herat for seven months was very far from agreeable, especially as we hoped to be in Cabul in December. Upon one hand, the plague was ravaging the city; on the other, the dearth of every article caused us to spend a great deal of money.

The streets of Herat are very narrow and dirty, but the roofed bazar, or *chársú*, gives an idea that in old days it was a great market in Khorasan. The shops are adorned by English chintzes, which are here very dear.

The people of Herat, though poor, are fond of pleasure. They go daily to gardens, which resemble paradisc, and pass their time in firing from horse-back, in racing, and also in singing, joking, dancing, and sleeping.

Their dress is a red shirt and an open red trowser, below a cloak or *chogha*, and on the head a turban of *Pesháwer lungi*. They tie a very thin cloth round their waist, and keep a knife on their girdle for show, and also for aggression.

The suburbs of Herat are exceedingly fertile, and covered by numerous villages, which extend as far as the eyes reach. The whole country is divided into four parts: namely, *Obaih*, *Kurakh*, *Ghuryan*, and *Sabz-war*, or *Isfázár*.

Since KAMRAN'S dynasty, the commerce of Herat has fallen to nothing. The caravans are plundered, as we ourselves were witness of. The resident merchants are fined in a large sum of money upon any foolish pretext of the Government.

There are two frequented roads from Herat to Bokhára, one goes through *Maimara*, where the caravans generally meet with difficulty. The other, which is easy, leaves *Sárakhs* on the left hand. By this last route the caravans cross the *Mur-gháh* river, and reach Bokhára after 23 marches, the distance of which (a merchant told me) is 110 farsangs, or 480 miles.

The caravan pays duty only in four places through all the way, and I have got the name of every stage written in my diary.

I subjoin the list of the income of Herat, which if you think sufficiently interesting and proper, you may include in this letter.

Tomans.

1 Money collected from <i>tehellát</i> ,...	1150
2 Weavers annually pay	1500
3 The soap manufacture is monopolized for	700
4 The monopoly of Bokhara caravan passing through Kurakh, ..	600
5 The head of the grape-sellers pays annually.....	250
6 Money collected by stamping skins and caps,.....	600
7 Money collected by the above means on new cloth,.....	800
8 Money collected by stamping woollen things,.....	100
9 <i>Mir Shahi</i> , or money collected by the inhabitants for the purpose of watching at night against thieves,....	200
10 The chief seller of the heels of shoes pays.....	160
11 Monopolizer of water and wind mills pays.....	600
12 Money collected from the people for catching thieves, <i>doozd bagiri</i> ,..	200
13 Cash collected from the districts or <i>Belúhats</i> ,... ..	2000
14 Custom-house officer of <i>Sabzwár</i> pays	300
15 Do. of <i>Ghuryan</i> pays.....	1500
16 Money collected from the black tents of <i>Emak</i> or <i>Elat</i> annually,..	2000
17 Monopolizer of wood for burning and all other uses pays,.....	300
18 The head of the horse-sellers pays	180
19 Money collected from <i>Zeh tábi</i> , or skin ropes, exported to India,.....	4
20 The inhabitants of <i>Caravan-serais</i> pay.. ..	50
21 Money collected from the <i>Kandahar</i> gate,.. ..	150
22 Do. collected from the <i>Khushk</i> gate,.. ..	50
23 Duty taken upon charcoal,.....	60
24 Money obtained from all shops,.....	1000
25 Duty taken upon tobacco,.....	200
26 <i>Dubbagh</i> or the head of skin-cleaners pays.....	110
27 Money collected from stamping the <i>kafsh</i> or a kind of shoe,.....	300
28 Monopolizer of assafoetida pays.....	600
29 Money collected from each Toman's king, called the <i>Toman Shahi</i> , ..	200
30 Manufacturer of the rice or <i>Shalí</i> pays annually,.....	600
31 Monopolizer of the mint (in <i>Haji Firoze's</i> reign, 50 <i>tomans</i> every day, now pays yearly,.....	120
32 Revenue of <i>Ghuryan</i> ,.. ..	220
33 Do. of <i>Obaih</i> ,.....	300
34 Do. of <i>Kurakh</i> ,.....	110
35 Do. of <i>Sabzwár</i> ,.....	100

List of the Corn produced in Herat, &c.

Karvan.

Corn produced in the suburbs of <i>Herat</i> ,.....	27000
Do. in <i>Obaih</i> ,.....	2000
Do. in <i>Kurakh</i> ,.. ..	1020
Do. in <i>Ghuryan</i> ,.....	2000
Do. in <i>Subzwár</i> ,.....	1300

20 Rupees make a Toman of Herat, which is equal to 6 Rs. and 12 As. of India.

Karvan is a measure of 100 maunds of Tabriz, which is equal to six maunds and 10 seers of India.

On the 4th of July, 1833, before the sun rose, we set out to the east of the city, to examine the place called *Gázur Gáh*, where the body of ABU ISMAEL, or KHAJEH ABDUL ANSAR, the son of ABU MANSUR, the son of ABU AYOUB, the son of MAT ANSAR, or the bearer of MUHAMMED'S Koran, reposes.

ABU ANSÁR was struck with stones by the boys, when he was doing penance, of which he expired in 1065, A. D., or in 481, Hejri*. He had learned about 12,00,000 poems by heart, and was the author of 1,00,000 couplets.

When we reached the pleasant *Gázur Gáh*, we entered the *Chár-su* or square of HASAN KIIAN SHAMLU, who has also built a few shops and a fine cistern on account of the periodical fair in spring. Having passed through the *sahan*, we came to the door which led us to the grave of ABU ANSÁR. The door is made of copper, and on each side are fine and clear mosques, where we saw a few Koráns laying on the shelves or *ráhals*. The *Musnavi*, or the book of Maulanai RÚM, is recited every morning, and the people faint during the invocation.

On our right hand were the tombs of MANSUR SULTAN, the father of SHAH RUKH MIRZA, and of the descendants of AMIR TIMUR. On our left were buried the successors of CHENGIZ KHAN. The body of MANSUR was lodged on a large platform, bordered with marble, and towards the head of the tomb we saw the following inscription :

ایں صفحہ بدیع البیان منبع الارکان کہ از کمال صفوت و صفا و غایت
 بہجت و بہا حاکمی نرہت ریاض رضوان راوی زینت مناظر جنان است
 وانوار رحمت الہی و آثار فیض فضل نامتناہی از ساحت لایم و تابان
 برای سلطان سعید مغفور غیاث السلطنت والدین منصور و اولاد مبرور
 عمارت یافت بتاریخ سال ہشت صد و ہشتاد و دو کہ فضل بی پایان
 بیان مینماید و نسایم خلد برین از شمایم تربت عنبرینش منتسم می آید
 چون بہشت از مرقد منصور سلطان رخ نمود
 این عمارت تابو جہی بس نکوتاریخ — بود
 نوشتہ سلطان مشہدی

The substance of the inscription may be thus rendered :

" This excellent construction and meritorious work which resembles Paradise, resplendent with the lights of divine favour and the blessings of the merciful God, has been built with great art and beauty as the monument of the famous Sultan GHUSUDDIN MANSUR and his pious descendants, in the year of H. 772. Written by SULTAN MUSHHADI."

* The year 481 Hejiri began on the 27th March, 1088, not 1065 as above stated.
 —ED.

Among the graves of CHANGIZ KHAN'S family was a body covered with black marble, on which we beheld the surprising sculptures of the ancient unknown hewer. The works are incomparable at the present day. The stone was carved in seven figures, called "*haft kalm*," or seven pens. I copied the following inscription from the above tomb :

بهر تاریخ شه عالیقدر طیبہ اللہ و تعالیٰ مشواہ
برسر تربت او کلك قضا کرد تحریر فقط طاب ثراہ

[On the day of the great king's death, the Lord sent him repose, and the pen of fate inscribed his simple epitaph "rest in peace." [A. H. 718.]

The tomb of ABU ANSAR was very large, bordered with marble, and covered with stones: on the head of the grave stands a marble *lôh* which resembles a *mînâr*: it is beautifully made of two pieces. The size of one piece is five feet high, and of the other is 10 feet. It is covered with Arabic letters, and has only one in the following Persian:

ان خواجه کہ در صورت و معنی شاه است و ز سر حقیقت دو کون آگاہ است
از روی حساب جمل اردانی فات تاریخ وفات خواجه عبد اللہ است

[The Khajeh, in look and verity a king, was equally versed in the affairs of both the worlds: would you know the date of his death, read it in the words '*Khajeh Abdulla*.' i. e. A. H. 737. The words اردانی فات give the same date.]

The tomb is commanded by a magnificent high arch, erected by SHAH RUKH MIRZA, 480 years ago. It is 70 feet high.

TIMUR SHAH resolved to gild the arch, but was diverted by some accidents. On the right hand of the tomb are many inscribed poems written by the celebrated author named JAMI, but the following verse made by HASUN KHAN SHAMLU informs us the day of ABDUL ANSAR'S death:

دهد تا ساقی عرفان دلت را جام هوشیاری در آذربزمگاهی خواجه عبد اللہ انصاری
بود لوح مزارش نازنین سروی کہ از شوخی ملایک را چو قمری کرد گرم ناله و زاری

[If you are desirous that the cupbearer of wisdom should give you a cup full of understanding, come into the banqueting house of *Khajah Abdullah Ansari*. His monument is like the graceful cypress which enchants the angels to hover over it, crying and lamenting like doves.]

When we came out of the door, we went to the cistern, which contains a very delicious, sweet-flavoured water, called *Ab Zem-zem*; it is cold in summer, and hot in winter, which I believe is owing to a deception in the temperature of the atmosphere. There were written plenty of verses in the arch, which I wished to copy.

بهر تعظیم مزار خواجه انصار کرد خان عادل شاه رخ چون وضع بنیاد حمل
 صحن کا زرگاه را رشک یفع الجنده دید ازقبوض روح اهل الله چون قدس خلیل
 بقعها انشا نمود و تکیه ها ایجاد کرد بهر توحید ثنای مالک الملک جلیل
 ساخت بهر تشنکان زایرین استان این مصفا بر که در راه رضای حق سبیل
 ساهما زین خیر جاری برد خلق الله فیض چون سحاب تشنه آب رحمت از دریای نیل
 چون که عمری همچو کشته سیله اواج خورد ساختن مستغرق تذشرا عاقبت حمل ثقبیل
 نیست در ترکیب آب و خاک چون رنگ ثبات باعث اوصاف اورا شد کین سالی دلیل
 کرد تعمیرش ز احفاد قان مرحومه بهر تحصیل ثواب وافی و خیر جهیل
 مهد علیا عصمت الدنیا و در درج احیا انکه نبود در حریم عفتش شبه و عدیل
 تا خورد زین برکه یکدم آب هر لب تشنه جرعه اوسازد از کوثر خداوند جلیل
 سال تعمیرش خضر جستم ز پیر عقل گفت
 ریخت از بهر کرم در حوض زمزم سلسبیل

[The purport of this long inscription is, that ADIL SHAH RUKH erected a well and terraces, &c. for the use of pilgrims to the tomb of KHAJEH ASSAR, which having fallen into disrepair were reconstructed at the expense of a female descendant of CA'N one of the sons of CHENGIZ KHAN in the year (*houz-zemzem-silsabil*) 1090.]

The original name of *Gázur Gáh* is *Kazar Gáh*. *Karzar* mean in Persian battle, and *Gáh*, place, (the place of battle;) in short, it is the seat of happiness and pleasure, and the people always go and pass their time in drinking and singing, which seems very inconsistent with the solemnity of the dead.

The water of the neighbouring covered fountain runs beautifully through the canal which ornaments *Gázur Gáh* and makes it a lovely spot in Herat.

Towards the north of the city, under the base of the hills, flourishes a pleasant edifice, called *Takht Safar* constructed by SULTAN HOSAIN MIRZA, the fourth descendant of AMIR TIMUR. In spring the neighbouring fields and mountains are covered with a bed of yellow and red flowers, called *Ur Ghavun*. The place is now going to decay, but seems to have been once a paradise. A tank of water possesses a magnificent fountain, which with its watery arrows fights with the top of the building. The height of the edifice is measured 100 feet.

In the reign of SULTAN HOSAIN MIRZA the punishment for the people of bad demeanor was to reduce them to the office of masons, who were

ordered to assist in the building of *Takht Safar*. He also published a poem and applied it on every gate, that the passengers should read it.

هر که با لاله رخاں بادۀ گلرنگ کشد
حکم مرزاست که بر تخت سفر سنک کشد

[All who have been trespassing in the pleasures of wine and beauty, by Mirza's command must add a stone to the *takht-safar*.]

To the N. E. of the city stand the two very grand ruins separated by the stream *Anjir*.

SULTAN HOSAIN MIRZA leaves his name by building a stately college, which is all levelled to the ground. Two arches and four minars have still a grand appearance, and are separated into two equal parts by the above stream. The arch and the two minars which are situate on the right bank of the water are in the vicinity of the grave of SULTAN HOSAIN, who is remembered with great respect and honor. He reigned in 1500, A. D. The head master of the college was the famous poet named JAMI, whose works are very interesting indeed.

On the left bank of the stream rests the body of GOHER SHÁD, the daughter of AMÍR TIMUR, and the sister of SHAH RUKH. The grave is shaded by a very high gilt dome. There were formerly nine tombs, all made of black marble, ornamented by inscriptions in the Arabic character. The letters are all rubbed out and not legible.

She built a fine edifice called MUSALLAH, and is said to have been the most incomparable lady in the world. She never married, but devoted herself to the perusal of the Korán; she was anxious to encourage the people to learn. The place is decorated by four high minars and two lofty arches, which make a beautiful square of 75 paces.

On the top of the arch were a few defaced Arabic inscriptions, which I could not read. The minars seem half finished, and bent towards *Meshid*, to salute EMAM REZA. I ascended a minar of two stories high by difficult paces, and had a very striking view of the city. Every story contains 20 steps.

Having passed the square, we entered a lofty dome, which encouraged us to climb five stairs, and to come into the gilt and painted room where GOHER SHÁD prayed.

All these ruins are decorated with azure and gold colour: (the blue colour is made of lapis-lazuli, which is found in considerable quantities in the mines of *Badakhshán*.)

It is alleged, one day GOHER SHÁD, accompanied by 200 beautiful ladies, came into the college, and ordered all the students to go out; she passed all day in the place, and had the pleasure of seeing every room.

One of the students, being sleepy, was not aware of her coming, and therefore he remained in the college. He awoke and peeped fearfully through the holes of the window. He cast his eyes on a ruby-lipped lady, one of the companions of GOHER SHÁD." She caught the sight of the scholar, and fell in love with him. She left her associates, and entered the room of the student, who gained the pleasure of her society.

She was a delicate virgin, and after leaving the student, she joined her party, who suspected her by the irregularity of her dress and manners.

GOHER SHÁD, on the information of this, was very much vexed, and to wipe away the reproach, she married all her associates to the students of the college, who were first ordered to avoid the friendship of the women. She gave them clothes, fine beds, and good salaries to live upon; she made rules for the collegians to meet their wives after seven days, on the condition not to forget their studies. She did all this to arrest the progress of adultery.

On the east end of the city flourished a very grand ancient building, called *Masjid Jamah*, or great mosque. It was erected by SULTAN GHIASUDDIN, the old king of Gaur, 700 years ago. He was the son of MUHAMMED SAM, and the sixth descendant of ABU BAKR, one of the friends of MUHAMMED.

The mosque has four doors and many arched domes. We made our entrance through the door called *dar-hauz-yakil*. Having traversed 70 paces under a roof supported by massive pillars, we opened into the great square of the mosque.

On our left hand were two pieces of marble, decorated with Persian inscriptions, which contained no valuable subjects, but an order to the custom-house officers, to provide the *mullas* with livelihood. The length of the square is 111 paces, and the breadth, 83.

There are four lofty and magnificently painted arches facing each other. The arch which stands to the west led us into the praying place, covered with heaps of mud, which has lately fallen by the severity of the winter. We saw a marble tomb-stone lying on the ground, which had Arabic characters. It was engraved by FEROKH SHAD SHERVANI, to cover the grave of SULTAN ABU SAED KURGANI.

The eastern arch exhibits a great deal of Muhammedan neglect. It is almost hidden under considerable masses of earth. The arch, which is situate towards the south, contains numerous Arabic inscriptions. They are all wasted away by the rains.

The northern arch is the place for students; it conducted us into a cupolated structure, where we were astonished to see a marble slab in

the shape of a door. It was of a single piece, and so beautifully clear, that our faces were reflected in it. The length of the stone was ten spans, and the breadth, eight.

Having passed through a very small door, we happened to come into a square of 20 paces, where the body of SULTAN GHIASUDDIN reposes. The place is very filthy, and the grave is reduced to pieces. There is no inscription at all. The roof has fallen into decay, and overwhelms the tomb. There are many graves also, and the bones of the dead seemed to be decayed. Our sight got dim by visiting the sepulchres. There was no difference between the tomb of the great Sultan and that of the poor man.

In the square of the mosque is a small cistern of water, for ablution, and a large heavy vessel of tin, made by SULTAN GHIASUDDIN; the circumference of which was 20 spans, and the thickness of the edge was one. There were inscriptions written on the borders of the vessel, dated 700 years ago.

It was repaired by MALAK GHIASUDDIN CU'RT, 470 years ago, and repainted by MIR ALI SHAIR, the minister of SULTAN HOSAIN, 350 years ago. The verse informs us the day of the repair.

این بقعه که کشته بود چون عظمِ رمیم مانده کعبه یافوت احیای عظیم
تاریخِ عمارتش ز دل جستم گفت ثانی بنای بنیۀ ابراهیم

[This place, which was before vile as a rotten bone, has acquired enduring fame like the *kaaba*. I inquired the date of the building, and my mind answered: "it is a second altar of Abraham." A. H. 950.]

The ruined buildings of Herat are beyond my ideas of description, and I am very sorry indeed that I am not well conversant with the English language.

One *farsang* far from the city towards the south is a famous bridge, called *Pul Málán*. In former days there were 33 arches, but now only 27 remain.

No history gives us any information about the foundation of the bridge, but the people say that it was built by a lady named NUR BIBI, who lived more than 1000 years ago. The books of Herat give no account of the bridge, which is called by the natives 'the matchless in the world.' The inundation of the river was so rapid, during our residence at Herat, that three arches were swept away from one end, and nearly for two months all intercourse between Herat and other places was arrested.

From *Kochan*, or *Kabu Shain*, where we were with the camp of H. R. H. ABÁS MIRZA, *Astrabad*, a sea-port town on the bank of the Caspian, is nine days' journey; and I am sorry not to know what sort of road continues from this to the above place; but in winter we hear the road

to *Astrabad* is so muddy and troublesome that foot passengers even find difficulty to go.

The horsemen from *Kochan* to *Herat* may come very easily in eight days, and are supplied with all sorts of provision in the way. From *Herat* to *Cabul* the route is beautifully covered with villages, the produce of which can feed a considerable army. It is 20 days' journey without crossing any hill.

On the death of VIZIR FATHA KHAN, his brother, DOST MUHAMMED, mutinied against SHAH MUHAMMED and Prince KAMRAN, and defeated them after a great loss. They escaped from *Cabul* and came to *Herat* through the *Hazára* country, after 13 marches; they were also accompanied by a numerous army.

SHAH ZAMÁN, on his coming to the throne, had occasion to quell an insurrection at *Cabul*, and arrived there from *Herat* in the space of 10 or 11 days, and a large body of horsemen accompanied him.

The road through which these two above-mentioned kings came to *Cabul* is hilly, and the people are called independent *Hazáras*.

From *Cabul* to the bank of the Indus, the road, through the *Khybur* country, is not to be traversed by carriages, and is eight days' journey: and from thence to *Lahore* we saw ourselves in some places that it was a difficult route. 15 marches bring the travellers from the bank of the Indus, or *Atock* to *Lahore*.

ALEXANDER THE GREAT, on his invasion of India, came by this road, without encountering any difficulty, and also NADIR, who is called an adventurer, followed his example.

Our last interview with SHAH KAMRAN was a very friendly one. He promised a great deal to be friendly with the British Government, and never to submit to the Persians, who he said, are the "obedient slaves of the Russians." He told Dr. GERARD to come again to *Herat* on leave from the Government, where they both will get a great advantage by working the valuable mines of his country.

III.—On the Climate of the Fossil Elephant. By the Rev. R. Everest, M. G. S. &c.

[Read at the Meeting of the 26th December, 1833.]

Since the discovery of fossil bones of the Pachydermata, and some large Carnivora in England and other parts of Northern Europe, it has been usual to consider them as evidence of a tropical climate having existed in those localities, while the animals to which they belonged were living.

The term has been rather vaguely used ; for the Cape of Good Hope, of which country four of the animals whose bones have been found most abundantly are natives, viz. the elephant, the rhinoceros, the hippopotamus, and the hyæna, is situated without the tropics, and in a hemisphere much colder than the northern one.

But, barring this, the assertion has been more seriously called in question by Mr. FLEMING, a Scotch naturalist, who observed, that the circumstance of certain animals being incapable of bearing a certain climate was no proof that their congeners laboured under a like disability ; and he instanced the rein-deer, which by its habits, its food, and its climate, is totally separated from the genus, in which, according to its conformation, it must be ranked.

Unless therefore (he continued) you can prove the identity of the fossil with the existing species, you cannot with propriety draw any conclusion, as to the climate the former may have lived in.

In confirmation of this, we may remark under what disadvantageous circumstances we commonly judge the animals of a tropical climate unable to bear our northern cold. They are mostly individuals who have not even been born in a domestic state, but have been caught wild, caged, and suddenly exposed to a great change of temperature. We see in our own people, and in animals brought with us from Europe, the consequences of such a change, equal to, though the reverse of, the other. What numbers are carried off, and how few can preserve a healthy and vigorous condition with every precaution that can be taken ; yet man, the horse, and the dog are, with little exception, the hardiest of existing animals, and the most universally diffused over the globe. We have a marked instance of the liability even of certain varieties of the same species to suffer more than others, in the Newfoundland dog, which, I believe, no one has ever succeeded in preserving alive in India.

The objection of Mr. FLEMING was strengthened by the circumstance that the elephant, which was found in Siberia preserved in ice had actually a coat of long hair, such as would have fitted it for living in a severe climate. Mr. LYELL too quotes from Bishop HEBER the information that along the lower range of the Himálaya mountains, in the north-eastern border of the Dehli territory, between lat. 29°, and 30° he saw an elephant covered with shaggy hair. I have inquired a great deal, of people used to elephants, respecting this, since my residence in the Dehli territory, but could never find any one who was aware of the existence of such a breed or variety of the animal. One solitary individual was mentioned to me, as having been seen at Dehli some years ago, with a good deal of long hair upon it, but it was altogether an

anomaly, being of a dirty white or cream colour, like the state elephants of the Burmese sovereign.

Since Mr. FLEMING raised the objection above stated, the discovery of fossil bones of the elephant in Yorkshire, intermingled with those of the Bison, a North American animal, and several species of land and fresh-water shells yet existing in Great Britain, seems to have determined, that the climate, at the period those animals lived, was nearly what it is at present. But it is still a question of some interest, how much that difference was; and our situation in a country, where races of animals similar to those, whose bones have been found fossil, are yet existing, enables us to throw some light upon this. I mean, of course, supposing the species to be the same. If we revert to Mr. FLEMING's objection that no argument can be drawn from the capabilities of one species, as to those of another, then we must desist from reasoning on the subject, until we can ascertain the law according to which different species of the same genus are distributed over the globe.

Of the six species of Carnivora which were discovered in the celebrated Kirkdale cavern, four are yet inhabitants of Northern Europe, viz. the bear, wolf, fox, and weasel; of the two others, the tiger and the hyæna, the first is sometimes found at the very edge of perpetual snow in the Himálaya, as we learn from Mr. HODGSON's account of the Mammalia of Nepal*. PENNANT too mentions it among the snows of Mount Ararat and in Armenia, and it is said to be abundant (see PLATFAIR's Geography) in the northern part of the peninsula of Corea on the eastern coast of China. This peninsula extends from $34^{\circ} 30'$ to 43° N. Lat. and its climate cannot differ greatly from that of Pekin in 39° N. Lat., where it is stated that the frost lasts from November to March, and that the thermometer is usually below 20° Fahrenheit at night in winter time. An account too, has lately been published in Calcutta of a trading ship (the Sylph) having been frozen up on the same coast, in Lat. 40° by the 1st of December. So that there can hardly remain a doubt, but that the tiger is capable of bearing a climate even more severe than that of England, probably one approaching to that of the southern coast of the Baltic.

The only circumstances essential to its existence appear to be a great extent of very thick forest, and an abundance of ruminant animals, both which would be the consequence of excess of moisture. It is most numerous, I believe, in Ceylon, the eastern peninsula of India, the Delta of the Ganges, and the vast belt of forests that border the outer Himálaya range; every where, in short, that great moisture, and the vegetation consequent upon it are to be found. Where the climate becomes dry, as in the country to the west of Delhi, the soil sandy, and the vegeta-

* Journal, As. Soc. vol. i. page 340.

tion stunted, it is supplanted by the lion, an animal which infested that part in great numbers a few years back, though since the arrival of the English it has become extinct, or nearly so.

I have not yet been able to ascertain the limit of the climate of the hyæna. But there are two animals in the list of the Kirkdale remains, viz. the weasel and the water-rat, that are, at present, confined to high northern latitudes. The first of these (see PENNANT'S Table of Quadrupeds of Arctic Zoology, vol. 1.) extends only as far south as Barbary, and the last no further than the south of Europe, so that, in a degree, they enable us to set a limit to the heat of the ancient climate, as the elephant and animals allied to it do to the cold. The next question, therefore, that occurs to us is,—what extreme of cold these latter are capable of enduring?

The greatest elevation at which the wild elephant is found in the mountains to the north of this, is at a place called Nahun, about 4000 feet above the level of the sea, and in the 31st degree of N. Lat. I have not met with the temperature of Nahun itself in any work, but we have given us in the GLEANINGS the temperature of Seharunpoor, 1000 feet, and Mussoori 7000 feet above the level of the sea, both places in nearly the same latitude and longitude. They are as follows.

Seharunpur Mean Temperature.

Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
52	55	67	78	85	90	85	83	79	74	64	55

Mussoori.

39	39.5	52	60	72.5	73	65.5	65.5	61.5	60.5	52	40
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Now Nahun being, as to elevation, half way between these two, we cannot err greatly in taking the arithmetic means of these numbers for its temperature. Thus, we have,

45.5	47	59.5	69	78.5	81.5	75	74	70	67	58	47.5
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for the mean temperature of each month, giving a yearly mean of 64.4. Now the yearly mean of Keswick in Cumberland, which we may assume for that of Kirkdale, is 48°, leaving a difference of 16.4° still to be accounted for.

But we may remark that this climate of Nahun is what has been called an “excessive,” in opposition to an insular, climate; that is, one in which, owing to its distance from the ocean, the extremes of heat and cold are very great. Thus, the month of January averages 45.5, and June, the hottest month, is 81.5, making a difference of 36 degrees; whereas, at Edinburgh, the mean of January for five years is 37, and of July (usually the hottest month there) only 60°, giving a difference of only 23 degrees.

It may be worth while to compare the five coldest months at both places. Taking the average at Edinburgh for five years, and adding one degree

for the difference of latitude between that place and Kirkdale, the numbers stand thus :

	Nov.	Dec.	Jan.	Feb.	March
Nahun,.....	58	47.5	45.5	47	59.5
Kirkdale,.....	42.1	41.8	38	39.8	42.1
Difference,.....	15.9	5.7	7.5	7.2	17.4

So that for the three coldest months in the year, the elephant actually endures a temperature not differing in the average more than 6°.8 Farh. from that of Yorkshire at the same season.

Now we have no reason to suppose the great heats of the summer essential to the existence of the elephant ; if, therefore, we alter only these five months at Kirkdale, so as to raise them above the minimum at Nahun (45.5), we have a climate, which we may reasonably suppose it capable of bearing the year through. Allowing the differences between each successive month to be as at present, we might place the numbers thus :

	Nov.	Dec.	Jan.	Feb.	March
Kirkdale,.....	50.1	49.8	46	47.8	50.1

The total number of degrees added to the five months is 40, which would raise the mean of the whole year from 48 to 51.3. The months of April and October would be warmer than at present ; but this would be compensated by the diminished heat of the summer months, which would probably be somewhat cooler.

Here then the argument of Mr. FLEMING applies with peculiar effect. Most species with which we are acquainted have certain breeds or varieties which are somewhat more hardy than their fellows. Thus the oxen, and sheep, and horses that are bred in the low pastures of the south of England, would perish in a country where the black cattle and sheep of the Highland of Scotland, and the ponies of Shetland, would thrive. If therefore it be not improbable to suppose that the present elephant of Northern India is fitted to live in an insular climate, the mean temperature of which is about 52° Farh., it is by no means unlikely that a breed somewhat hardier may have existed in a mean temperature four degrees lower, or 48°.

There is yet, however, some further evidence, that the elephant is capable of bearing a climate somewhat similar to that which has been above assigned to it.

HANNIBAL, on his famous expedition into Italy, took with him a considerable number of elephants, which were probably obtained in Mauritania. A detailed account has been left us of the difficulties he was subjected to, particularly in the passage of the Alps ; but it is no where that I can find stated, that the elephants suffered more than the other beasts of burden belonging to the camp. The transport of them across

the Rhone is minutely told; and yet, though the army remained four days upon the snow; though Hannibal himself is said to have told one of his Roman prisoners, that he had lost 36,000 men, besides a vast number of horses and other beasts of burden; though he is represented by his adversary SCIPIO, before the engagement on the banks of Tesino (Ticinus), as having lost two-thirds of his horse and foot in the passage of the Alps, yet nothing is said about the elephants, until the battle of Trebia, when, owing to the severe fatigue, and long exposure to a snow-storm, great numbers of men, cattle, and almost all the elephants perished. Shortly afterwards, we read of a pitiable destruction of men and cattle in the attempt to pass the Apennines, and that here also seven of the elephants, which had hitherto survived, were lost. One only was left in crossing the marshes of the Arno in the ensuing spring.

Thus, it appears, that these animals, who had the disadvantage of being born in a climate far to the south, and not even reared in a domestic state, endured the extreme cold and privation consequent on the passage of the Alps late in the autumn, and a winter campaign succeeding it. Now the elephant, though capable of sustaining great burdens, is said to bear long marches and scarcity of food very indifferently. These two causes, therefore, must have contributed in a great degree to their loss.

HANNIBAL recruited his army with men and cattle in the countries he passed through, and was thus enabled to proceed; but we have no account of what proportions of the original expedition, which left the shore of Africa, were living at the time of crossing the marshes of the Arno, and what had perished. In the absence of this, we can only guess at the different capacities of man, the horse, the ox, and the elephant, to endure fatigue and cold. Yet did we know nothing of this last, except from the history above alluded to, we could hardly doubt, but that, if gradually inured to a colder climate, in a succession of generations, it would easily bear any temperature above the freezing point.

The freezing point, however, would of necessity set a limit to the existence of any animal of the size and structure of the elephant. In a country occasionally subjected to heavy falls of snow, which remained unthawed upon the ground for several days, such a creature would be unable to move about in search of food, and must consequently perish. On this account, the elephant of Siberia could not have lived in a very severe climate, notwithstanding its long hair and mane.

It is singular, that the ancients should have had a tradition of an animal somewhat similar, not maned indeed, but crested: "*Mirum unde cristatos Juba tradiderit*" is the expression used by PLINY in speaking of

the elephants of Ethiopia, which were a different breed, it appears, from those of Mauritania.

If we turn to the map of Europe, in the 2nd vol. of *LYELL's Geology*, we shall find that a great proportion of it was beneath the sea at a late geological period, a circumstance fully sufficient to account for the small difference of climate, which we have supposed to be necessary for the existence of the elephant. We know enough of the laws which regulate the atmospheric phenomena, to be able to assert this change as one that must necessarily have happened. It is needless, therefore, to investigate the matter further.

I have not been able to learn the greatest elevation at which the rhinoceros is to be found, but it cannot be much less than that of the elephant.

There is another question connected with the climate of these extinct animals, and that is the period of their existence. The bones of some of them have lately been found in caverns in the south of France, intermixed with those of men, and fragments of a rude kind of pottery. Some have endeavoured to explain away the direct inference from this fact, viz. that the animals were contemporaneous with the human race, but hardly with success.

We know nothing of Gaul before the conquest of it by Cæsar, nor have we any account of Germany of an earlier date. What species, therefore, may have existed in the wildernesses of these countries, for a thousand years, or more, previous, we cannot determine. The fossil elk of Ireland, which was once termed "antediluvian," is now believed to have existed in the forest of Germany at a comparatively late period. Since the time of the ancients, several large animals have become extinct in regions which once harboured them. Thus the lion has deserted Greece since the time of Aristotle. The elephant has left Northern Africa (I mean that part of it to the north of the great desert), and the hippopotamus the Nile, since the days of the Cæsars. The rhinoceros, which a few centuries back was found as far to the west as Attock on the Indus, is now confined to the forests east of the Ganges. Can we then suppose that in the many centuries previous, during which it was co-existent with man, its limits were not greatly circumscribed? Is it not rather probable that both it and the elephant (which is now limited by the Sutlej) may at no very remote period have been found far west as the Caspian, and that from thence as well as from still further limits both have gradually retreated, as they are still retreating, before the attacks of man, and the clearing of the forests.

IV.—*Chirra Punji, and a Detail of some of the favourable circumstances which render it an Advantageous Site for the Erection of an Iron and Steel Manufactory on an extensive scale. By Lieut.-Col. Thomas C. Watson.*

Now that the commercial privileges of the East India Company are abolished, and that free scope is given to the improvement of India, through the enterprising speculations of British subjects, it may fairly be expected ere long that the efforts of enlightened industry, and all the aid of modern machinery and scientific research, supported by a liberal outlay of capital, will be employed in perfecting the existing produce and manufacture of the country, as well as bringing into vigorous and flourishing development many sources of national prosperity which have hitherto languished under the unwholesome shadow of a wide-spreading and disqualifying monopoly.

My present object however is not to speculate on possibilities, but to bring forward a few plain matters of fact, which may appear to others who have the means of turning them to account to be pregnant with matter of some importance.

A residence of considerable duration in the Kasya or Silhet hills, and my observations and inquiries while sojourning there, have impressed my mind with a full and satisfactory conviction, that works might be established in those hills for the manufacture of iron and steel on a very extensive scale, and under as favorable a combination of circumstances as can well be imagined or desired. It would be foreign to my purpose, and I fear beyond my ability, to attempt anything like a scientific treatment of this subject, and I shall therefore content myself with merely detailing in the order in which they strike me, certain *matters of fact*, leaving the inference to be drawn from them to those better qualified than myself to consider the question in all its bearings and relations.

The sanitary station of Chirra Punji is situated on the range of mountains that bound the plains of Silhet on the north, and which run nearly east and west. There is little or no rise in the country, to the very foot of the hills; the ascent to which is for the most part very abrupt. The Sanatorium is about 4,200 feet above the level of the sea, and distant about eight or ten miles from Tyrea Ghat, where the ascent commences, to which place the Pandua river is navigable nearly half the year. The journey from Tyrea to Chirra is seldom performed in less than four hours.

The average temperature of Chirra throughout the year is more than

twelve degrees of Farenheit below that of the plains of Bengal : in the months of March, April, May, September, and October, the difference is full twenty degrees.

As to climate, my own opinion, founded on personal experience of its effects on the health of my own large family, is highly in favor of its salubrity. I have no hesitation in giving it the preference to any I have ever been in ; it must however be admitted that a widely different view has been taken on this point by others, who consider the dampness of the atmosphere, during the rains, as injurious to persons labouring under organic affections of the liver ; whether this opinion is correct, or not remains to be proved, for I believe a large majority of medical gentlemen who have visited the Sanatorium concur in considering the climate as highly congenial to the European constitution : in which opinion they are borne out by the florid and general healthy appearance of the European soldiers ; but more especially of children, amongst whom no casualty has taken place in three years, though many have been afflicted with complaints incidental to childhood, which in all human probability would have proved fatal in the plains ; some also who have been sent as a last hope in a state of extreme debility have been restored to perfect health in a few weeks. In these hills Cholera has never been known, although its ravages have frequently extended to the villages at their feet. The bilious remittent or jungle fever of Bengal is also unknown, and I believe no instance has occurred of a fatal case of dysentery.

Tyrea Ghat, which is at the commencement of the ascent, may be reached by the Pandua river, which is navigable for small boats, from the beginning of May, to the end of September ; during the other months land carriage commences from Pandua, or Munipoor Ghat, the former distant from Tyrea two, and the latter four, miles. The Kasya porters however make no additional charge, their fares for conveying a load of one maund up or down the hill being four annas, whether taken up or laid down, at Tyreah, or either of the other stations. The road between Tyrea and Chirra has been recently much improved, and is for the most part practicable on horseback. There is no doubt that a liberal outlay of money, under the directions of a skilful engineer, would make it fit for wheeled carriages, at all events for elephants and loaded bullocks ; it is also certain that at a moderate expence means might be devised of bringing coal, iron, and other bulky and heavy articles down to the plains, at one-tenth part of their present cost ; but I shall take a future opportunity of submitting to the Asiatic Society, a model of a cheap and simple machinery, which I have contrived for the purpose.

From Calcutta, by a steam boat, the journey to Chattak (on the Soorma river) may at all seasons be performed in less than six days.

Chattak is distant from Tyrea Ghat by the way of Pandua about fourteen miles, which is generally performed in from four to eight hours.

The journey from Dacca to Chirra, by large accommodation boats, usually occupies about ten or twelve days; the return voyage is performed in five or six days. Ladics and sick people are carried up the hill in light doolies by two Kasyas, for eight annas each; but the liberality of passengers has of late caused a considerable increase in this charge. Children to the age of eight or ten years, are taken up with great security and comfort in baskets, by a single Kasya porter, for four annas. Bulky articles, which cannot be carried by a single person, often cost a sum for conveyance, which appears out of all proportion; for instance, a chest, weighing a maund and a half, will be taken by one man for one rupee; but a square piano forte of the same weight will not be carried for less than ten or twelve.

The only provisions used by Europeans, which are produced in the hills, are beef and pork: these are abundant, cheap, and good. A cow fit for killing, weighing about 200 lbs., may be purchased for six rupees, and a well and clean fed porker, for the same price; of late the Kasyas towards Myrung, in the interior of the hills, have got into the way of cultivating potatoes with great success: these at present are sold at rather a high price, but a few years will bring them down. The crop comes in at the most convenient season in the month of September, when Patna potatoes become unfit for use, of which advantage might be taken in supplying the Calcutta market. A few other vegetables may also be had in the hills. It must be admitted however that little progress has yet been made in gardening.

Grain of all kinds is brought from the plains. Rice sells from 35 seers to one maund for a rupee; other grains, in proportion; but at all times much cheaper than in Calcutta. Eight ducks for a rupee; large fowls, nine and ten for a rupee; small fowls, 20 and 22 for a rupee; eggs, 160 for a rupee; bread, 12 loaves for a rupee, but competition will make this much cheaper. Sheep must be brought from the plains and fed. Farmyards answer admirably; pigeons thrive and increase rapidly; rabbits require more care than has hitherto been bestowed on them; milk and butter abundant, but rather dear.

The native fruits are excellent and abundant in the season; that is, from November till the end of February, the finest oranges in India may be had for about one thousand for a rupee.

The pine-apple plant, which produces the hemp, of which specimens are sent herewith, is raised with hardly any care in the culture, in all the valleys surrounding Chirra, but chiefly in that of Nanguth, about six hours' journey from the Sanatarium, where it flourishes in great luxuriance.

producing in the season, June, July, and August, an abundant crop of fruit, which is admitted to be as much superior to pine-apples grown elsewhere in Bengal, as the Kasya (or as they are called) Silhet oranges are to those of any other part of India. When in full season, this fruit is some times sold at the Sanatarium at upwards of 380 for one rupee; it is rather above the common size, weighing from $\frac{1}{2}$ to $\frac{3}{4}$ of a seer each; it contains much juice, and it only remains to be ascertained, whether this fine fruit (certainly the cheapest, considering its quantity known to exist any where) may not make fine cider, or whether by distillation, it may not be converted into good brandy. The leaves of the plant are gathered by the Kasyas according to the wants of their respective families, and *not* for the purpose of *trade*, generally before the commencement of the rains; they are soaked in water for some time, before the fibre is separated by being beaten out, this fibre appears remarkably strong, but I have not had opportunity of submitting it to any comparative trials. It is chiefly used by the Kasyas for the net pouches or bags which form part of the equipment of every inhabitant of the hills. One of these I have the pleasure to send you. Should this hemp be found adapted for cordage, canvas, or even for paper, it may become an article of much importance, as I can assure the Society that the plant may be spread to any extent that may be supposed desirable, with little care and hardly any expense.

The pepper vine grows wild in the jungles; it is also cultivated in small quantities about the houses of the natives. The specimen now forwarded is the produce of such culture. It is used by the natives in their ordinary food, and is sold in the bazar of every village; but I have not been able to find that it is ever exported. There can be no question however but the cultivation of this vine may be extensively increased.

Specimens of Indian Rubber I have already presented to the Society. It is produced from a tree which grows to a considerable size amongst the rocks, and which being of quick growth may be propagated with ease to any extent from suckers or even from slips; but even without increasing the plant, a very considerable supply might now be furnished were the article to be in demand. From the various purposes to which it has lately been applied in England, it may one day become a valuable article of export; in its liquid state I have succeeded in moulding it into any shape.

The cotton which is brought by the Kasyas to the plains for sale is purchased by them from the Garrows, a tribe inhabiting the northern side of the range of hills which divide Assam from Sylhet, but as this article has been already fully described by Captain FISHER I merely mention it whilst enumerating the various productions of the Kasya moun-

tains, which may eventually become valuable articles of commerce.

Honey and bees'-wax are produced from bees kept, as in England, in a domestic state, but they are also obtained from the jungles. As yet bees'-wax has only been exported in small quantities; there is, however, no reason why it should not be abundantly collected as an article of traffic, if not of manufacture on the spot.

The Kasyas have no regular artificers, except blacksmiths and iron-founders, but they are all handy and expert in the use of the *daw* or cleaver, and also with the adze, with which they square their timbers and smooth their planks. They are not often employed in building houses, as workmen from the plains come up in any number that may be required; of these, excellent bricklayers may be had at the rate of seven rupees a month; good carpenters, at seven rupees per month; grammies, at five ditto; stone-cutters, at five ditto; coolies, at four ditto. Kasya workmen may be hired by the day at three annas, but the best way of employing them, and the way they like best, is by contract; in this way, the tasks they perform are incredible. I shall scarcely be believed when I state the particulars of some task-work, which was executed by a few Kasyas, with their wives and children, in the course of last month (October, 1833). I had a wall built round my estate of dry stones, those on the exterior being broke into square or oblong slabs, so as to present a smooth, well-built, and regular surface. This wall was four feet high, at the base it was four feet wide, and two feet at the top; each foot in length consequently contained twelve cubic feet of masonry; but every twelve feet in length, containing 144 cubic feet, were completed at one rupee twelve annas, till the whole was finished, measuring upwards of 800 feet; thus, six cubic feet, weighing, I should suppose, more than 1000 lbs. cost only one anna:—cheaper labour than this I imagine it would be hard to find in any country. The Kasyas are remarkably athletic and industrious; their women partake in their hardest labours; and the children commence carrying heavy burdens at a tender age: they live well, have comfortable houses, and the poorest amongst them is not without gold or silver ornaments.

Their wealth has heretofore resulted from the manufacture of iron, which process is explained by Mr. CRACROFT in the fourth number of your journal for the month of April, 1832. Of late, the sale of iron has been unusually dull, and numerous individuals who were employed in digging, washing, and smelting the ore, are out of employment.

All these people are available for any manufactory that may be formed at Chirra, at very moderate wages.

Building materials, either for temporary or permanent buildings, are abundant and cheap; for the former, posts, eighteen feet long, and from

eight to twelve inches in diameter, cost one rupee each; marwells and roaks, or roof sticks, eighteen feet long, and four inches in diameter, sell at ten and sixteen for a rupee; small hill bamboos, called aspar, ten feet long and $\frac{2}{3}$ of an inch in diameter, for lath and plaster walls, and binding on chuppers, or grass roofs, cost one rupee for 250; latkorahs, or squared timbers, five inches square, and eighteen or twenty feet long, for joists or rafters, sell four for the rupee; rattan grows at the foot of the hills, and is remarkably cheap; good grass for thatching is brought from the plains at four rupees a thousand bundles, each (being tight bound) measuring $7\frac{1}{2}$ inches in circumference.

For permanent buildings, the common grey sandstone, which forms the structure of the table land of Chirra, is found by far the best material. This stone is found in inexhaustible quantities, in slabs or layers from six inches to two feet thick; it may be easily split into square blocks by the wedge and hammer; these blocks require little or no dressing before they are passed into the hands of the mason. When the puckah houses belonging to Messrs. SARGENT and CRACROFT were erected, the facility of working this stone was not understood; hence, a material was used, a red spongy soft sandstone, which was squared by the Kasyas, and sold at the enormous rate of four rupees a hundred; these same stones now sell for one rupee the hundred; but they will never again be made use of in building. The common grey sandstone before alluded to is the same of which the wall is built, which I have described under the head of price of labour: it hardens from exposure to the air, and is not in any situation liable to decay or decomposition. It is of this stone also, cut into blocks of eight or ten feet long, three feet wide, and two thick, of which the monument to the memory of the late Mr. SCOTT is now in progress of construction under the orders of the Government; it is likewise the material employed by the Kasyas for their tomb stones, some of which are single blocks, standing nearly thirty feet high, being bulky in proportion, and which, according to the tradition of the natives, have stood uninjured for many centuries. Lime-stone is brought to the spot whenever required, within the Sanatorium, for six rupees the hundred maunds: burning it even in the simple and wasteful manner now adopted costs about ten rupees more, so that good fresh lime, fit for use, only costs sixteen rupees the hundred maunds; it may however be burnt on an extensive scale in proper kilns, for five or six rupees the hundred maunds. Fire-wood for burning lime costs four rupees eight annas the hundred maunds. Good sand for mortar may be got in the immediate neighbourhood of any spot where a building is to be erected: excellent clay for making bricks or tiles is found within half a mile of the Sanatorium; but except for mixing with mortar and building furnaces, bricks will not be much in use at Chirra. Good timber may be had, and

of considerable scantling, but the price increases in proportion to the difficulty of conveyance; beams of twenty-two feet long and nine inches square cost six rupees each; but if the Kasyas were furnished with trucks for its conveyance, large timbers might be brought in, at one-fourth of the Calcutta price. The saw is not yet brought into use for cutting planks: a saw-mill might with advantage form part of such a concern as I should recommend to be established at Chirra. The experiments which have hitherto been made in the pukka or terrace roofs of Messrs SARGENT's and CRACROFT's houses, lead to an opinion that they will not answer at Chirra. Mr. CRACROFT, I believe, has fully adopted this opinion, and expresses a conviction, that permanent buildings will require to be roofed with copper, lead, or spelter; but I am far from coinciding in this conviction, being satisfied that a fair trial has not yet been given to terrace-roofs: those at present existing, which have failed, were constructed too late in the season, and consequently were not sufficiently beaten down and consolidated before the heavy rains set in. Pukka roofs to be effectual at Chirra should be constructed at a pitch of about fifteen degrees; should cover the walls and project so as to form a sort of false verandah from three to four feet beyond them. The composition should be laid on by the middle of December; and the process of beating down should be slowly and regularly persevered in, till a perfect consolidation is obtained. Such a roof I am convinced will answer; and if so, a most important object will have been accomplished, as all the materials are on the spot; whereas, metal for roofs must be brought from Calcutta at great expence, and experienced workmen must also be brought to lay them on, and kept in employ for their occasional repair.

These valuable materials are supplied in exhaustless abundance from a range of hills which run about three miles north and south across the table land, extending between the Sanatorium on the east, and the village of Nunklow on the west. This range rises abruptly to the height of about four hundred feet; its summit is flat, and it is covered from top to bottom, in contradistinction to the surrounding hills, with timber jungle and luxuriant vegetation; its base may cover an extent of six or seven square miles (but this is mere conjecture). At the foot of this range the lime-stone is produced, and at about one-third the distance up, a seam of coal is exhibited of from ten to sixteen feet thick, in various directions, so as to leave no doubt of its extending almost in an horizontal stratum through every part of the range; this seam has been the more easily traced, as there have been slips from all parts of the range, leaving perpendicular gaps, where the various strata composing the structure of the hill lie exposed to a considerable extent of its elevation.

At the foot of one of these gaps or slips it was that I first discovered,

amidst the wide-spreading confusion, large masses of coal. I took Mr. Cracroft to the spot, and his scientific skill enabled him at once to detect the seam from whence these masses were supplied, and to hazard a confident conjecture that it extended throughout the whole range, and this conjecture has been fully verified by discoveries which have since been made. The specimens which have been sent to Calcutta and proved at the mint, and also by the Secretary of the Physical Class of the Asiatic Society, were taken from the heaps of the material which lay exposed to the air and weather. At the time we thought the specimens excellent, and I believe a favorable report was made of them in Calcutta, but we have since ascertained that they are beyond comparison inferior to the coal which has been detached from the seam. This is now in use at Chirra, and is admitted to be of the very finest quality, being largely impregnated with bituminous matter, easily converted into coke, and leaving scarcely any ashes or earthy residue: a specimen shall be forwarded to the Society by an early opportunity. This supply which may be wrought with the greatest facility, and which is not more than one mile distant from the Sanatorium, might be estimated to meet the demand of ages; but it is ascertained that the material exists in all parts of the hills in profuse abundance.

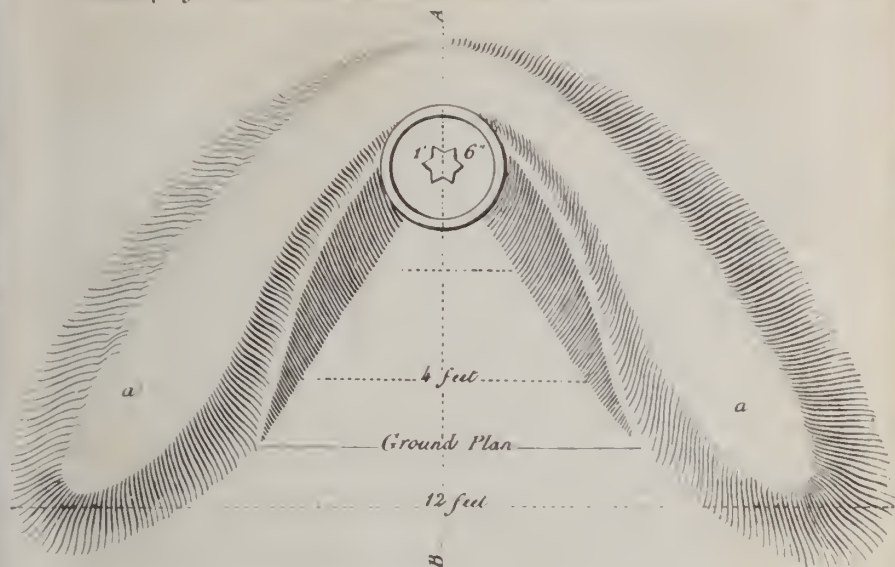
The manner in which the iron ore is obtained and worked is, I believe, fully described in Mr. CRACROFT'S paper before alluded to; it therefore only remains for me to state that it may be brought in to any required extent at twenty-five rupces the hundred maunds; two-thirds of this price however may be considered as payment for the conveyance. Any means that can be devised to facilitate this, will proportionally reduce the price. I shall forward to the Society by an early opportunity a few seers of the ore, that its quality may be submitted to experimental proof, and I have reason to believe it will be found of the very finest quality.

Coke for smelting iron may be made on the spot to any extent, and charcoal for making steel is abundant and cheap, and a little arrangement in making it will still farther reduce the price.

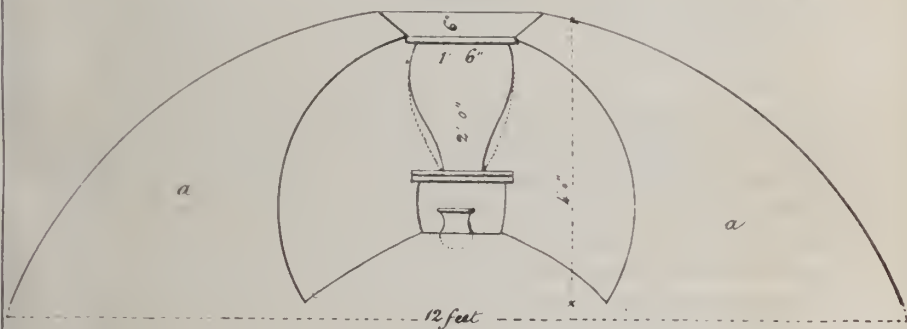
The pipe-clay of Chirra has I believe been already noticed by Mr. CRACROFT as a valuable commodity in the manufacture of crucibles, furnaces, and fire-bricks.

In the neighbourhood of Chirra there are numerous streams that supply sufficient water in the driest seasons, to work overshot mill wheels, but the river which bounds the Sanatorium on the west and south is decidedly the best that can be selected, from its vicinity to the coal, lime, and clareoal; also to the bazars, and populous village of Chirra Punji. In the course of this stream, from the village of Chirra to that of Moosmai,

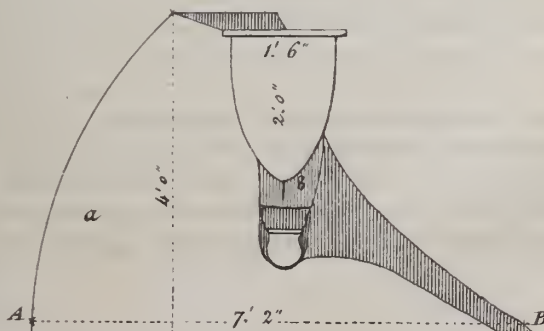
Sketch of Salt Sand Mounds in the Sumna.



Elevation



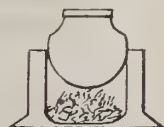
Section at A B.



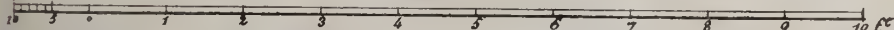
*Plan
Fire Place*



*Elevation
Fire Place*



Scale



at the edge of the table land, where it plunges over a perpendicular precipice of two thousand feet, there are numerous spots admirably calculated for the construction of water-mills—spots where there are abrupt falls of from ten to twenty feet, and from whence aqueducts might be made to regulate the supply of water required.

When I commenced this sketch it did not occur to me that I should have been led into so much of what may appear tedious detail. I fear I may have almost exceeded the limits allowed, but I shall now conclude by saying, that should the Secretary of the Physical Class, or any other scientific gentlemen from the presidency, feel inclined to visit Chirra, and form their own judgment on the facts I have endeavoured to detail, he or they, should they proceed by a steam-boat, will find at Chattak six hundred maunds of coal for their return-voyage. This supply has been brought down the hill by Mr. Cracroft and myself, expressly with the view of encouraging visitors from Calcutta, in the expectation that the frequent report of competent and disinterested individuals may at length open the eyes of the Government and of the community, to the many advantages, as a sanatory position, and as a highly valuable acquisition, which belong to the hitherto neglected station of Chirra Punji.

V.—*Description of the Mode of Extracting Salt from the damp Sand-beds of the River Jumna, as practiced by the Inhabitants of Bundêlkhand.*
By Lieut. J. S. Burt, *Engineers.*

The operation is performed by three persons, one of whom is employed in collecting a quantity of damp sand, another in preparing a filtering vessel, and filling it, as well as in emptying a receiving vessel of the saline liquid which has been collected, and the third in superintending the boiling of the liquid until it evaporate, and leave a salt at the bottom of the pitcher. The sand selected for the purpose is that which swells up (*phulta*), or is raised by the solar heat a little above the general surface of the bed, and is generally found near to the stream, where the moist saline particles are alone affected by the sun; however, a quantity of sand becomes intermixed with the salt as it swells into innumerable little hillocks, which vary in size from an inch to three or four inches, or more, in diameter, according to the quantity of saline matter contained in them.

As soon as the gatherer has collected a common ratan-basketful of sand, he conveys it upon his head, and depositing the contents near to the filtering vessel, returns for a fresh supply; then comes the filler. It is however necessary first to describe the manner in which the filtering vessel is set up. The accompanying plan, elevation, and section

(Plate I.) shew it; *a* is a mass of sand heaped up to the height of about four feet, on three sides of a *nānd*, or baked earthen pot, which measures from one and a half to two feet in height, and fifteen to eighteen inches in breadth; it is fixed into the mass of sand, and rests upon three, and sometimes upon two, pieces of stick or bambu placed across the top of a receptacle, in which lies a small *ghara* or pitcher immediately below it, so as to receive the drops of salt-water as they fall down through an aperture cut in the bottom of the large *nānd* or pan. Over and perpendicularly across the aperture is placed a thin bit of stick or bambu, sufficient to bear a small piece of coarse cloth, which is laid across the stick, depending down through the opening to the distance of about three inches, and directed to the little pitcher below; upon the stick is placed an irregular spherical fragment of tile, or earthen pot, broken angularly, so as to allow the water which disengages from the sand to flow beneath it, and pass along the piece of cloth that rests upon the stick to the receptacle below. In addition, a second piece of cloth is laid over the tile, so as to cover, it, and prevent any sand from escaping underneath the latter, and mixing with the filtered liquid; every thing being prepared, the filler throws into the *nānd* a quantity of the saline collection, until the vessel is filled to within two or three inches of the top, when he fills up the remaining space with fresh water, taken from the river close by; the water in a short time percolates the sand, and falls into the pitcher by the means above-mentioned, and is found to consist of a brine, exceedingly salt in taste at first, but diminishing afterwards according to the quantity of water which is added from time to time, as the upper surface subsides. The liquid in the small pitcher is emptied into a third pan, in which it is conveyed to a *chulah* or clay fire-place, sometimes prepared at the spot, but more frequently at the manufacturers' abode, where it is subjected to the action of the fire, and allowed to simmer under a slow heat, until the liquid has all evaporated, and the salt remains at the sides and bottom of the vessel. The colour of this salt is brownish; it is of an excellent quality, and is much superior to the black salt which is given to horses, and if it were refined, would, I doubt not, be fit for the table; the flavor being very good when the salt is fresh.

It is rather a curious circumstance that salt should be found mixed with the sand of the Jumna, a river of which the water is so pure and fresh to the taste, (although it is considered by the natives as almost unfit to be drank in the hot and rainy seasons;) the quantities gathered are, however, under the present management of the poor, trifling, and but barely sufficient to give the laborer a sustenance, although he is allowed by the Raja in Bundelkhand a portion or plat of sand free to himself and family for the season. The rates, quantities, &c. are as follows:

Each of the three persons, (sometimes women are employed,) can gain their anna per day by making two and half seers of salt, which sell at the rate of one rupee per maund. They work each from sun-rise till about noon, and not later, as they consider "sufficient for the day is the evil thereof;" besides, after twelve o'clock, the sun becomes too powerful for them to work out of doors.

The locality of this salt preparation is on the Bundélkhand side of the river, about thirty-six miles by water, and twenty-four by land, above Culpee; is under the authority of the Budèk Raja, and is situated opposite to the village of Marhapoor, near Karimkhan (or Kurmookah Ghat), where the chief operations of removing the rocks which impeded the navigation of the Jumna have been carried on for some time past.

The favorable season of the year for this salt operation is only in the hot dry months of April, May, and June, before the river rises; for on its subsidence, which takes place at the close of the rainy season, the sun must be allowed to gain some power before these people can attempt a renewal of the process, because the only sand from which the salt is disengaged is drawn forth and raised above the general surface of the bed by the direct influence of the sun's heat, which is not sufficiently powerful in the cold season to produce such an effect. I am not aware whether the little hillocks of swollen-up sand subside again or not after the sun's departure below the horizon, but I should think that they do not. A number of sand mounds, fifty or more, raised here and there, some given up, and the rest in progress, were to be met with in June last; but I should scarcely think if the preparation of salt were carried on after this manner on a more extensive scale, that it would reimburse the speculator for any large sums of money that he might hazard in the manufacture of the article.

It appears, from the natives' account, that four baskets filled with this saline collection weigh about two maunds of forty seers each (160 lbs.), or forty lbs. each basketful; also, that half a seer (one lb.) of salt was extracted from a maund weight, or eighty lbs. of sand. That a day's work, consisting out of doors, of six hours, (passed in collecting, filling, and filtering till noon; and the rest of the day in the evaporating process,) enabled the manufacturer to prepare a sufficient quantity of salt for him and each of his family to gain an anna a day clear, for the fire cost him but little, as he gathered or picked up the fuel, consisting of old sticks and *gobar*, or dried cow-dung, and he purchases the earthen pots for a mere trifle, and they last a long time, excepting the one subjected to the action of the fire. This anna, equal to three half-pence, is found to be sufficient for the individual's maintenance; but I suspect he gains something more, as he stated that

to every labourer whom he employed in excess to his own family, he paid hire at the rate of an anna a day.

He sells the salt unrefined, at the cheap rate of one rupee per maund of forty seers, but this afterwards sells in the towns or cities whither it is conveyed, at a rate triple or quadruple (as I understand) its first price; it however previously undergoes a process of refinement. Half a seer of salt per diem is prepared from each of the mounds in which only one *ghara* is fixed, so that to enable a family of three persons each, to get their anna a day at the above rate of one rupee per maund, they must keep up fifteen sand mounds, with a *nānd* in each.

I do not know what is the proportion of salt found in the superficial hard crust of the dry earth at Cawnpoor*, where I have seen people scraping the ground for it, to the depth of half an inch, or more; it would be worth while to ascertain, but I should think the proportion of salt there exceeded that found in the bed of the Jumna, although it is probably not so good.

As the *nānd* was only filled once a day with the sand, and as half a seer, equal to one lb., of salt was extracted from it during that period, the proportion of the latter to the former will be easily found; for,

The *ghara* contained (by calculation) 0.8836 decimal parts of a cubic foot of sand; considering the space that was filled with it to be a hemisphere, and the specific gravity of sand being 1520, the weight of that quantity will be eighty-four lbs. nearly; therefore the proportional weight of salt extracted from thus much sand, will be one lb. of salt to eighty-three lbs. of sand, nearly. The native's account agrees extraordinarily well with this calculation, for he said that half a seer of salt was extracted from a maund weight, or eighty lbs. of sand, as before noticed; thereby differing only three lbs. from this statement: his assertion therefore is to be relied upon as nearly correct.

VI.—*On the Saline Nature of the Soil of Ghazipoor, and Manufacture of Common Salt, as practised by the Natives of the Villages of Tutulapoor Ratouly, Sahory, Chilar, and Becompoor. By Mr. J. Stephenson, Supt. H. C. Saltpetre Factories in Behar.*

The surrounding soil in the vicinity of the above villages in the district of Ghazipoor contains a large proportion of various kinds of saline matter, such as muriate, sulphate, and carbonate of soda, together with nitrate of potass (saltpetre) and nitrate of lime.

Near the village of Ratouly, about four eoss N. W. of the station, an opulent native is making a large new tank. Here the excavation already made afforded me a section of six feet deep. The first four feet

* See Journal vol. i. page 503.

from the surface is formed of mud and clay: below this, two feet of kankar contained a large proportion of saline matter, consisting of sulphate and muriate of soda. The efflorescence is in such abundance, on the sides and bottom of the excavation, that I gathered it in handfuls, to obtain an average sample. The bottom of the tank was covered with kankar in nodules and lumps resembling stalactites.

The circumstance of so much saline matter being found here at the depth of four feet below the surface, resting upon and impregnating the stratum of kankar, naturally leads me to the supposition (taking all appearances into consideration) that a constant, but slow, decomposition is going on between the carbonate of lime, contained in the kankar, and the muriate of soda in contact with this singular stratum. Hence the formation and development of carbonate of soda, in the same manner as observed in the Natron lakes, and beds of Egypt, by the justly celebrated French chemist BERTHOLLET, though, from his description, the appearances in that country are more strongly developed, than I observed to be the case at the above place. The upper part of the kankar bed being undulated, it therefore frequently crops out at the surface, and of course the saline earth in proportion. This accounts for the efflorescence appearing in patches, as it were, especially when moisture is retained in the soil at all seasons, which is the case in the vicinity of jheels. However, as I wish to confine myself to facts alone, I leave this subject to be taken up by others better acquainted with geology than myself. There seems (as far as my observations extended) to be no want of materials for nature to operate upon; for in the space of a few miles I found the earth to contain sulphate, muriate, and carbonate of soda, with here and there the nitrates of potass and lime, distributed in patches through a large tract of country.

Near the above excavation for a tank, and close by the village of Ra-touly, is established the largest salt factory that I had an opportunity of inspecting. I generally found them situated where the patches of muriate of soda predominated, and the following notice attempts to describe the operations of the manufacture as it came under my own observations during my visits to the factories for the purpose.

The manufacture of salt is commenced on the latter part of the month of February, and is carried forward till the commencement of the rainy season; for being upon the principle of solar evaporation, the operations can only be carried on during the dry hot months.

The first operation is to scrape the surface of the soil (in the same manner as saltpetre is scraped off and gathered in Tirhoot), and collected in heaps near the filters. The latter are the same in principle, though different in shape and size to those used for the manufacture of saltpetre,

being an oblong square of fifteen feet by five, and not more than nine inches in depth. They are built with the stiff kankar clay, with the stalks of sugar-cane laid crosswise, to form the bottom of the filter, instead of bamboos and mats used to form the bottom of the saltpetre filters. A few which I saw had a layer of jungle grass laid over the canes, which rendered the filtering process more effective.

About fifty maunds of the saline earth is operated upon, at each charge. This raw material being laid on the bottom of the filter, so as to form an uniform thickness of about five inches, and trodden down to the desired hardness by the feet of the operator. Water, from a well close by, is then poured upon the earth to the depth of three or four inches, and the whole suffered to remain tranquil for the space of several hours, during which time, the fluid finds its way through the earthy bed, and dissolving the salt in its passage, runs off in the form of a weak brine, by means of a spout into an earthen vessel used for a receiver.

The brine thus obtained is more or less charged with a colouring matter from decomposed vegetable matter and oxide of iron which the kankar soil contains. On a subsequent examination of the brine from several filters, I found the average to give a specific gravity of 1.095.

The brine obtained in the above manner next undergoes a subsequent process, as follows :—on the surface of the ground, near to the filters, evaporating beds are constructed of about twenty feet square, and not more than four inches in depth. The bottom is formed of the nodules of *kankar* limestone, plastered over with a cement of the same material, similar to the roof of a pukka built house. These pan-like squares are for the purpose of solar evaporation. A thin layer of cow-dung is spread over the surface of this evaporatory, and the *ras* (as the natives term the brine) is poured over, till the dung is saturated. The evaporation goes on, and when the mixture is sufficiently dry, the saturated dung is collected into a large heap, in order to be burned, or calcined, in the same way that *khāra lon* earth is burnt in Tirhoot, except that the cow-dung serves instead of rice-straw for fuel.

The calcined saline mixture is then removed to a filter (formed of clay), of smaller dimensions than the one above, which I have attempted to describe, (being only about five feet long, three broad, and two deep,) when it is again subjected to the process of filtration. But in this second process, no more water is used than is necessary to dissolve the common salt (which is known to be more soluble than most other salts) contained in the calcined mixture; consequently a very strong solution of brine is obtained from this second operation. By the process of burning, the colouring matter is in some measure destroyed, so that the brine from this second operation is less coloured than that resulting from the

first operation of filterings, and its specific gravity of course is much increased. It is now sufficiently prepared for final evaporation, and is therefore removed again to the evaporating squares, and exposed (very thin) to the action of the sun and heated air, which it appears is sufficiently powerful to evaporate the saline solution to dryness, leaving a thin crust of a brownish white coloured salt attached to the bottom of the solar evaporatory, from which it is taken off by means of an iron chisel.

The salt thus obtained is, however, far from being a pure article: an average sample which I collected, and subsequently subjected to analysis, produced the following result—100 grs. operated upon.

Insoluble matter (sand).....	3.0
Sulphate of soda,.....	37.0
Muriate of soda,.....	60.0
	<hr/>
	100.0

A slight trace of nitrate of lime was detected during the examination.

The quantity of salt produced, of the above quality, at the *Ratouly* factory, is twenty-five maunds for each filter, and there being seven in number, the total produce for three months' operations will amount to 175 maunds, which, at the stated price of rupees four per maund, make a total value of rupees 700. However, as this amount is from the manufacturer's own statement, the real produce may be one-third more.

An average sample of the saline earth, which I carefully collected from the heaps merely scraped off the soil at two of the factories, being analysed, gave me the following result :

100 grs. operated upon.

The filtered solution made no change on turmeric paper. It therefore contained no loose alkali. I obtained precipitates from the following re-agents, viz. muriate of barytes, nitrate of silver, oxalate of ammonia, prussiate of potass, and liquid ammonia: these precipitates, being carefully washed and dried, produced the following equivalent results :

Earthy matter, insoluble in the three mineral acids.	{ silex.....	89.0
Earthy matter, soluble in muriatic acid,	{ carbonate of lime.....	4.0
	{ alumina and oxide of iron..	0.2
Saline matter, soluble in water,	{ sulphate of soda.. .. .	2.7
	{ muriate of ditto.. .. .	1.5
	{ nitrate of lime	0.4
	{ moisture.....	2.0
	{ loss.. .. .	0.2
		<hr/>
		100.0

VII.—*Progress of the Boring for Coal at Jamutra in Cutch.* By Capt. C. W. Grant, *Engineers.*

[Extracted from that Officer's Report to J. Bax, Esq. Sec. to the Bombay Government, communicated to the Asiatic Society by the Supreme Government, 30th Jan.]

"On the 3rd instant, I dispatched 125 maunds of coal from the vein at Dujapoor, agreeable to the desire of the Right Honorable the Governor.

"I continued sinking the bore at Jamutra as mentioned in my letter of the 18th June, until towards the latter end of July, when the rain fell, and the river came down so suddenly, that I had but just time to save the boring apparatus, and it was of course impossible to go on with the work, so long as the monsoon continued. At this time also, the whole of my establishment, my personal servants, and the sepoy guard, were attacked with fever—one man only out of 31 escaping it, so that I was obliged to allow them to go into Bhooj, for a few days, for change of air. As soon after the receipt of your letter of the 24th July, as the men had regained sufficient strength to work, I commenced digging out the coal at Dujapoor, and by the beginning of September, had it all ready for shipping to Bombay; since then, we have again been working at the bore at Jamutra, and we have now got down 184 feet below the bed of the river, or 190 feet below the general level of the country, principally through the sandstone and slate-clay, with here and there an exceedingly hard stratum or band of iron stone, as will be better seen by the enclosed list of the numerous strata passed through. The last 22 feet of white sandstone consists entirely of the finest particles of white quartz, and is evidently the channel of an underground spring; for after sinking through it some feet, the water rose, and flowed out at the mouth of the hole in large quantities, night and day, without ceasing, as much as could be conveyed away by a seven or eight inch pipe. It is rather brackish, it cannot be otherwise, as it has to pass through 148 feet of very brackish water, which is constantly flowing in from the sides of the hole, before it can reach the surface; but I have no doubt, but that if it came up through pipes, it would be perfectly sweet. I particularly mention this circumstance, as the boring for water is now becoming of great interest, and my meeting with a spring 190 feet below the level of the plain, shows that success in that line should not be despaired of, even when not found at small depths. The flow of water is constant and uniform, and runs down the river in a fresh stream, and very much impedes our work; so much so, that added to the great depth of the bore, it renders the work exceeding tedious and difficult. I am only waiting to hear the result of the trial of the coal just sent down, to stop work here, and should the coal be approved of, have it in contemplation to commence a bore at Dujapoor, and see if any other veins lie under the present one.

In the mean time, I am about to make a long tour through the northern and western parts of the province, where, I think if any where, coal is likely to be found. I have already examined a great deal of the eastern side of the country, and after this trip, shall have a tolerable idea of the geology of the province.

"The strata passed through in the present bore, as shown by the enclosed list, are such as usually denote the presence of coal; viz. sand stones, slate clay, and iron ore, and iron pyrites, and bear a very strong analogy to the sections of some of the coal districts in England. Whether coal exists beneath this, the means at my disposal do not permit me to ascertain, except at a great cost; but from the evident traces and presence of coal, though in small quantities, over a large extent of country of which Jamutra is one boundary, still inclines me to think that it must, though in this instance I have not been fortunate enough to hit upon it.

The establishment of a steam communication between Bombay and Europe being now I hope placed beyond a doubt, the discovery of coal so conveniently situated as this, appears to me to be more than ever a desideratum, and I beg you will assure the Right Honorable the Governor in Council, that no exertions shall be spared on my part to contribute to so desirable an object."

List and description of the several Strata passed through in Boring for Coal at Jamutra in Cutch.

No.		feet.	inches.
1	Red and brown sandstone.....	20	0
2	Thin band of clay iron ore or stone,....	0	6
3	Brown sandstone.....	1	6
4	Thin band of clay iron stone,.....	0	6
5	Argillaceous sandstone and slate-clay in thin alternate laminæ,..	4	0
6	Clay iron stone,.....	0	3
7	Sandstone and slate clay in thin laminæ,..	5	0
8	Amygdaloidal rock in a state of decomposition,....	2	0
9	Shale slate clay containing a thin vein of coal,....	1	10
10	Sandstone slate clay in thin laminæ,.....	5	0
11	Light red sandstone,.....	1	6
12	Sandstone and slate clay in thin laminæ,.....	5	0
13	Light-brown sandstone,	0	11½
14	Deep red ditto,.....	3	3
15	Light-brown and yellow ditto, very soft,.....	7	9
16	Brown argillaceous sandstone,..	3	11
17	Reddish brown sandstone,.....	1	3
18	Very argillaceous sandstone,.....	0	11
19	Variegated sandstone,	4	0
20	Deep red ditto,.....	3	10

<i>No.</i>	<i>feet.</i>	<i>inches.</i>
21 Sandstone composed of very coarse grains of quartz, &c. and colored deep red by oxide of iron,.....	1	2
22 Fine argillaceous sandstone and slate-clay,.....	0	2
23 Very coarse quartzzy sandstone or breccia, deep red,.....	0	9
24 Ditto ditto white ditto,.....	3	7
25 Very argillaceous sandstone,.....	1	1
26 Very coarse light-brown sandstone,.....	1	4
27 Brown sandstone, fine,	4	0½
28 Coarse quartzzy sandstone,.....	2	10
29 Very hard red sandstone,.....	1	1
30 Sandstone and slate-clay,	1	8½
31 Red ferruginous sandstone, exceedingly hard,.....	2	0
32 Very coarse quartzzy sandstone,.....	0	7
33 Argillaceous sandstone,.....	1	5
34 Clay iron stone, excessively hard,.....	1	7
35 Deep red sandstone,.....	5	9
36 Very argillaceous sandstone, strongly impregnated with iron,.. .	9	10
37 Excessively hard rock, consisting of particles of quartzzy-clay slate and strongly cemented in ferruginous clay.....	2	0
38 Reddish argillaceous sandstone,.....	9	3½
39 Very coarse quartzzy breccia or sandstone,....	3	8½
40 Very fine grained sandstone,.....	1	4½
41 Very coarse quartzzy ditto,	1	10
42 Red sandstone,.....	4	8
43 Hard red clay,.....	0	8
44 Hard brown sandstone,.....	2	5
45 Blue clay or slate clay,.....	6	0
46 Grey or pyritous iron ore, exceedingly hard,..	1	6
47 Slate clay,.....	1	3½
48 Pyriteous iron ore, exceedingly hard,.....	2	3
49 Blue slate clay, with pieces of iron pyrites,.....	14	0
50 Hard red iron stone, very difficult to cut through,.....	1	3
51 Slate clay,.....	4	0
52 White sandstone, composed of extremely fine particles of quartz,	15	0
53 (A few small pieces of coal were now brought up) : perfectly white sandstone, composed of extremely fine particles of quartz,	7	0
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54 Total depth of bore at present reached, including 42 ft. 1 in. in the height of the bank of the river.....	190	1½

N. B. Below the white sandstone is a very hard rock, at which we are now working, and which serves as the pavement of the water channel described in the letter.

VIII.—*Discovery of an Ancient Town near Behut, in the Doáb. By Capt. P. T. Cantley, Supt. Doab Canal.*

[Extract of a letter read at the Meeting of the 30th instant.]

"I have this day despatched by dáik banghy, for the museum, a number of coins, of very great interest, from their having been found in the site of an ancient (apparently Hindu town,) which site is now seventeen feet below the present surface of the country, and upwards of twenty-five below that of a modern town near it. I will confine myself in this mere notice at present, to stating, that in consequence of the clearing out of the canal bed south of the Belka falls, near the town of Behut, north of Sehárunpoor, the exposure took place; and on the canal being laid dry shortly after, the coin, &c. were found amongst the shingle in the bed of the canal. I may mention that this line is altogether distinct from that which is said to be the ancient canal, and therefore even were there not distinct marks to the contrary, there can be no quibbling on the articles having been *transported*, which is a favorite argument of the day. In the present case, the section is thus; the surface of the country at that point being much lower than that on which the town of Behut stands:—

Grass jungle with cultivation on the surface of the country. River sand, $4\frac{1}{2}$ feet.

A seam of sand with traces of shingle.

Reddish clay mixed with sand, $12\frac{1}{2}$ feet.

A.....A, site of ancient town,.....A.....A

Black soil full of pots, bones, &c. in which the coin and other articles have been discovered, 6 feet.

Bed of canal, 23 feet below surface.

The line marked above "site of ancient town A A A A" is distinct in section for about a quarter of a mile, and were it not for the breaking down of banks, &c. it would be seen much further; the soil upon which the town appears to have stood is very black, and full of bones and pieces of pots of different description: bricks of a large size, and of unusual shape, appearing as if they had been made to suit the circular form of wells: pieces of the slag of iron-smelting furnaces, (such a thing as smelting iron at Behat was never heard of,) arrow heads, rings, ornaments and beads of different descriptions; in short, an Oriental Hereulaneum, for there appears every chance of the discoveries being extended hereafter. The appearance of small pieces of kankar (amongst the shingle), of which I also send one or two specimens, is an extraordinary feature, as kankar is not known in this part of the country."

NOTE. The probable date of Lieut. CAUTLEY's subterranean city, to whatever cause its inhumation may be attributed, can be pretty well placed

within cognate limits through the very fortunate discovery of many coins imbedded in the same place with the bricks and bones. The coins belong to three different species already made known through Mr. WILSON's paper on the Society's cabinet*.

1. The *Indo-Scythic* coin, or that having the figure of a man in a coat of mail, offering something on a small altar (Nos. 23 to 33, Plate II. As. Res. xvii.), which has been referred with much probability to the commencement of the Christian era:—of this only one coin is recognizable out of 26.

2. The chief part of the coins belongs to the series No. 69, Plate III. of the same volume, of which nothing at all is known; only two have hitherto been seen, one of which was dug up in cutting the trench of the new road from Allahabad to Benares: this however was square, as was a duplicate in Colonel MACKENZIE's collection, but all those now brought to light are circular: they are identified with it by the elephant on one side, and by one or more singular monograms. Some of them differ considerably in other respects; having a Brahmany bull on the reverse, and an inscription in unknown characters round the edge†.

3. The third species of coin is of silver. A square lump with no regular impression, but simply stamped with various *chhāps*, as might have been the custom anterior to the general introduction of coined money. Of this ancient coin, the MACKENZIE collection furnishes abundant examples, (Plate V. figures 101 to 108,) but his researches altogether failed in ascertaining their date, or even their genuineness, both which points are now satisfactorily developed by the present discovery. They must all date posterior to the Indo-Scythic dynasties in Bactria, and belong to a period when (as in China at present) silver was in general current by weight, while the inferior metals (for all of the present coins are not of copper) were circulated as tokens of a fixed nominal value.

This discovery alone would be of great value, but it is only one of innumerable points for which we may eagerly expect elucidation from this *Hereulancum* of the East.

The appearance and state of the tooth and bone sent down are also of high interest; they are not entirely deprived of their animal matter, though it is in a great measure replaced by carbonate of lime. The tooth is of the same size, and belongs to the same animal (the ox) as those of the *Jumna* fossils, presented by Capt. E. SMITH at the last meeting, but the mineralization in the latter has been completed, whereas in these it remains imperfect.

J. P.

* See Asiatic Researches, vol. XVII.

† We shall insert drawings of these coins, and of other objects discovered on the same spot, when Capt. CAUTLEY favors us with further particulars.

IX.—*A Brief Account of the System adopted by Divers in the Deccan, for the Recovery of Valuables, lost in the Tanks and Rivers of that Province.* By Lieut. G. J. Taylor, 7th Mad. Lt. Cav.

Happening to lose a valuable diamond ring when swimming some years since in a tank in the Deccan, I was induced to employ a set of divers for its recovery: not, I confess, with much hopes of success, notwithstanding the confident tone in which I was assured they seldom or never failed in their search. I was however most agreeably disappointed, for after seven hours' labour, the ring was found. As the mode which they adopted, for the recovery of the lost article, was new to me, and may possibly be unknown to many of your readers, I venture to forward the following brief sketch of their proceedings. The head of the set I employed, and who eventually was successful in his search, was a celebrated diver in that part of India. He wore a beautiful gold bangle on his right arm—a present from the Peshwa BAJEE RAO for having recovered a valuable emerald from the Tapti river, which that prince had dropped in crossing the stream. He assured me, that although a most laborious and sometimes painful trade, he had usually found it a lucrative occupation.

I may add that I subsequently saw the same mode adopted, on various occasions, for the recovery of the nose ornaments, ear-rings, and other jewels lost by women when bathing on the ghats of the great rivers and banks in that part of the country, and almost always with success.

Their method is as follows:

A set of divers consists of three persons, two of whom dive by turns, while the third sits on the adjoining bank. The two divers wade to the place pointed out, if within their depth, each carrying with him a circular flat-bottomed wooden basin, with sloping sides, about seven inches deep and two and a half feet in diameter. With this the diver descends, and having scooped into it as much of the surface of the mud or sand as it will contain, ascends with the platter and sends it ashore, where its contents are carefully washed and examined by a third person. If the water be not deep, when one man has stooped under water, he is kept down by his partner, placing one foot upon his neck or shoulders, until the platter is filled, on which a signal is made, the foot is withdrawn, and the man rises to the surface. But when the depth of water will not admit of such arrangement, the diver sinks a grapnel or heavy stone from a canoe, and then descends by the rope. When he ascends, the platter is lifted into the boat, and there examined. In this way, they continue to work for hours, each diver descending in turn, until they have examined the whole surface of the mud or sand around the place pointed out, and very seldom fail of success if ordinary information be only afforded, as to the spot near which the

article has been lost. They remain under water from one to one and a half minute at a time—oft-times more, if the water be deep. They adopt the same system precisely, whether in still water or in a running stream : only that in the latter, of course their labour is more severe—their success more precarious.

Their remuneration depends solely on success ; the ordinary salary being one-third of the extricated value of the lost article, and which is divided in equal portions among the set.

X.—*Register of the Weather at Futtehgurh (Lat. 27°21' N. Long. 79°30' E.) from April 1832 to October 1833. By M. P. Edgeworth, Esq. C. S.*

The thermometer was placed in the open air, on a wall fronting the north, until 1st January, 1833, when it was removed to an open veranda on the north side of the house. Up to 26 Sept. the maximum was taken by a self-registering thermometer, which was accidentally broken : it was then taken at 2½hp. m. till December, }
 2 p. m. till April, } by a spirit thermometer,
 3 p. m. till August }

and from August 6, by a self-registering thermometer. The minimum all along by a self-registering spirit thermometer.

NOTE. We have endeavoured to render the abstract, into which want of space has obliged us to condense our correspondent's register, more complete by expressly numerically the number of days, windy, cloudy, fair, &c. in each month, as far as can be gathered from a register not intended to shew these points with accuracy. The columns of west and east wind comprehend 45° degrees on either side of the cardinal point, as it seemed more proper to class these winds (north-west, south-east &c.) with the directions generally prevalent, than with the north and south winds, which are of rare occurrence.

The mean temperature of Futtehgurh seems nearly as high as that of Benares or Ghazipoor*, but we are not aware that the instruments used had been previously compared with a standard.

For four days of 1832, Mr. EDGEWORTH took the temperature every hour during the day and night: which enables us to prove that the supposition of deriving the mean temperature of a place from the means of two hours of the same name will not hold good. At the foot of the hourly register we have given the means of the pairs thus deduced; and under them the errors from the mean of the whole (75°.55), which may be taken as the corrections due to each pair. The mean of the extremes of heat and cold (76°.55) is 1.00 higher than the mean diurnal range. In my register for Benares (App. x. As. Res. xv.) I found the excess to be 0.86, which is a near accordance with Mr. EDGEWORTH's result.—J.P.

* See vol. i. 29, and vol. ii. 604.

Register of Temperature and Weather at Fattchgarh.

Month.	Thermometric Averages.							Winds.				Weather.			Remarks.	
	Min.	10A.M.	Max.	10P.M.	Mean of all.	Mean of Diurnal variation.	Monthly deviation from annual mean.	Calm.	N.	W.	E.	Clear.	Cloudy.	Rain.		Storms.
1832.																
April,	72.3		96.0		84.1	23.7	°	9	5	9	4	30	—	—	10	10 North-westers.
May,	76.6		101.		88.8	25.1		1	0	28	0	31	—	—	1	1 Ditto, fresh wind.
June,	82.5		104.2		93.4	21.4		6	0	13	0	11	?	—	4	6 Storm, with rain.
July,	80.1		94.0		87.1	14.5		8	0	1	0	22	—	16	1	1 Storm, sultry.
August,	78.9		90.9		84.9	12.5		1	5	11	2	12	9	6	15	1 Storm, sultry.
September,	74.6		89.9		82.2	15.3		2	0	18	0	10	—	—	—	1 Storm, sultry.
October,	65.8		84.9		75.4	19.1		2	3	9	1	16	29	?	1	1 Hot wind six days.
November,	57.9		72.7		68.8	21.8		?	?	10	?	4	30	?	?	1 Fine.
December,	49.5		66.5		58.0	17.0		?	?	3	?	17	10	4	—	Cloudy, register not filled, ? all fair.
1833.																
January,	47.6	59.8	71.1	58.4	58.2	17.1		?	—	4	3	26	5	—	—	1 Fine.
February,	54.4	64.1	72.0	62.1	63.1	17.6		2	2	19	2	3	20	6	2	1 Variable weather.
March,	65.1	76.8	83.7	73.0	74.6	18.6		3	1	0	6	22	4	5	0	0 Monsoon set in.
April,	76.6	87.8	95.6	84.1	86.0	19.0		0	3	25	0	2	30	—	4	4 Strong hot wind.
May,	83.3	92.0	99.9	90.2	91.3	16.6		0	2	14	1	14	28	3	4	8 Violent storms, hot.
June,	88.5	98.0	104.8	94.5	96.4	16.3		?	0	23	0	7	20	8	3	8 Dull morns, stormy.
July,	82.9	88.3	92.0	86.5	87.4	9.1		0	0	9	0	22	10	14	3	3 Light, rainy.
August,	82.2	86.3	88.1	84.4	85.2	5.9		0	1	9	0	21	8	15	12	2 Changeable-clearing.
September,	80.7	86.8	91.4	84.9	85.9	10.6		1	1	11	0	17	22	7	3	0 6 Days hot wind.
Mean of 1st yr.,	67.1	—	85.2	—	76.4	18.6		—	—	—	—	—	—	—	—	—
2nd year,	69.5	78.2	85.7	76.0	77.5	15.7		5	13	140	4	115	262	78	148	27

Hourly Observations of the Thermometer taken for four days in 1832.

1832.	XII.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.
19th Aug.	81	80.5	80.5	80.5	80	80	80.7	83	85.7	88	89	90.8
23rd Sept.	77	74.5	74.5	74.5	74.1	73.3	73	77	79.7	84.5	88	90
21st Oct...	67.5	65.5	65	64.8	63.7	61.8	61	61.6	66.5	71	74	76
18th Nov.	59	57	56.5	55.7	55.3	55	54	54	57	62.7	67	72
Means, ..	71.1	69.4	69.1	68.9	68.3	67.5	67.2	68.9	72.2	76.5	79.5	82.2
1832.	Noon.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.
19th Aug.	94	92	91	90	90	88	86	85	84	83	82.5	82
23rd Sept.	92	92	92.5	92	91	90	86	82	80.5	79	79	78
21st Oct.	79	81	81	79.8	78	75	71	69	68	67.3	67	66.9
18th Nov.	75	77	78	78	77	74	70.3	68	64	62	61	60.5
Means, ..	85	85.5	85.6	84.9	84	81.7	78.3	76	74.1	72.8	72.4	71.9
Do. of pairs.	78.1	77.5	77.4	76.9	76.1	74.6	72.7	72.4	73.2	74.7	75.9	77.0
Differences.	+2.51	+1.89	+1.73	+1.36	+0.59	-0.91	-2.80	-3.10	-2.37	-0.86	+0.39	+1.47

The last column shews the differences of the means of pairs (of hours of the same,) from the mean temperature of the whole twenty-four hours $75^{\circ}.55$. The 19th August was cloudy after ten o'clock; the rest were fine throughout. The greatest heat of the day occurs at 2 p. m.: the minimum temperature at 6 o'clock in the morning.

XI.—Note on the Botanical Specimens from Mount Ophir.

[Accompanying Lieut. Newbold's Letter—Read 30th February.]

The specimens from Mount Ophir, with which I was favored the day before yesterday, consist of two Ferns, three Lycopodiæ, and two Phænogamous plants. They are not in a good state of preservation, and only one has any fructification, but they are nevertheless very valuable, and I feel greatly obliged to Lieut. NEWBOLD for them. The most interesting among them is a specimen full of good sori of *Matonia pectinata*, BROWN, published in 1830, in *PLANTÆ ASIATICÆ RARIORES*, vol. i. p. 16, tab. 16, from a specimen, unique in Europe, which was gathered in the identical locality by Col. FARQUHAR. The individual now before me beautifully confirms the generic character and general observations relative to this remarkable fern, which were politely supplied for the above work by Mr. BROWN; in shape it differs in having a bifid frond, the pinnae being unilateral towards the bifurcation. The other fern may perhaps be a *Blechnum*. The Lycopodiæ are very curious, and belong seemingly to new species. Of the Phænogamous plants, one is exceedingly remarkable. It has the habit of some members of the coniferous, as well as the myricaceous, tribe; the structure of the wood obviously brings it under the former; the leaves are accrose, opposite, and gland-dotted. Perhaps it is a *Dacrydium*. The other plant belongs perhaps to the family of Ericææ.

Botanic Garden.

N. WALLICH.

XII.—*Proceedings of the Asiatic Society.*

Thursday Evening 30th January, 1834.

The Rev. Principal W. H. MILL, Vice-President, in the chair.

After reading the proceedings of the last meeting, the Society proceeded to ballot for the officers of the ensuing year, when Sir C. T. METCALFE, Sir J. FRANKS, Rev. Principal MILL, and Mr. W. McNAGHTEN, were elected Vice-Presidents: and

J. Tytler, Esq. Capt. A. Troyer,	C. E. Trevelyan, Esq.
Baboo Ramcomul Sen, J. R. Col-	Dr. J. T. Pearson,
vin, Esq.	D. Hare, Esq.
Capt. W. N. Forbes,	Dr. N. Wallich,

were elected Members of the Committee of Papers.

Messrs. HAMILTON, MACKENZIE, STOPFORD, and BEATTIE, proposed at the last Meeting, were unanimously elected Members.

Before proceeding to the business of the meeting, Mr. J. T. PEARSON proposed the following resolutions, which were carried unanimously:

1. That the thanks of the Society be tendered to Mr. J. PRINSEP, for his liberality in circulating copies of the *Journal*, edited by him, gratuitously to the Members.

2. That under existing circumstances it is expedient that the Society pay for all copies distributed to its members for the future, as well as for the past year.

Read a letter from W. E. FRERE, Esq. Secretary, Bombay Branch Royal Asiatic Society, acknowledging the receipt of the 17th and 18th volume of the *Asiatic Researches*, and requesting to be furnished with the 15th and 16th volumes. Also letters from H. HARKNESS, Esq. Sec. Roy. Asiatic Society, and from J. FOUNALL, Esq. Sec. of the British Museum, advising receipt of the 17th volume.

Read a letter from J. TYTLER, Esq. Sec. Oriental Translation Committee, regretting that the state of their funds would not admit of their undertaking the publication of Mr. YATES' *Nalodaya*, in India, and proposing either to transmit it to the Home Translation Committee, or to subscribe for copies, should the author prefer printing it on his own account. To be referred to Mr. YATES.

The Secretary read the following report on the accounts and proceeding of the past year.

Annual Report.

"In drawing up a report upon the affairs of the Society for the past year, I shall confine myself to points connected with the finances and constitution of the Society; the literary and scientific objects which have been brought forward during the year have been already noticed in the printed proceedings of the monthly meetings, and are therefore well known to all the members. The mode of publishing these proceedings in detail, and furnishing lists of all the books presented, members elected, and papers read, has only been adopted for the last two years; but it has already been

of material benefit to distant members, who have become more connected with the main body through these means, and have frequently applied for books which they have seen announced, or have taken part in discussions going forward within our walls, and have become more active contributors of new facts in the literature and science of the vast country within our range. The good effect of publishing and spreading abroad at once all that goes forward in our Society cannot be better proved than by instancing the letter read this evening from the Secretary to the Bombay Branch of the Asiatic Society, which was before ignorant that any volume of Researches had been published later than the fourteenth ! That the published Researches are not so wellknown, or so generally distributed, as they ought to be, may be implied from the complaint in the third volume of Professor HEEREN'S Historical Researches, that he was only able to get access to the first twelve volumes of the Transactions. All this will now be corrected through the activity of our agent, the Boden Professor, whose interference has already been visibly productive of amendment in the despatches of books from Europe, latterly left too much at the discretion of the book-seller.

The number of members at present on the list is 85 : the diminution during the past year has been, by death, 2 ; by retirement to England, and other causes, 10 : the addition from new elections has been 14.

The receipts and disbursements, as abstracted from the collector's general account, are exhibited in the accompanying statement. They contain many items belonging properly to the last year ; such as the printing of the last two volumes, which have necessitated an encroachment on the stock of the Society to the extent of 7500 rupees. Strict economy has however been preserved with regard to the expences of the present year—the whole, including a remittance of £100 to our agent in England, being within the sum absolutely collected in the same period, and leaving a balance in hand, if the outstanding quarterly bills be included, of nearly five thousand rupees.

PAYMENTS.

To paid Military Orphan Press, for printing 500 copies of the 18th vol. Asiatic Researches,	4,286 14 0
To Bill for Repairs, Museum &c. passed in December, 1832,	1,023 15 1
To Establishment from Dec. 1832 to 31st Oct. 1833.	1,933 11 0
To Contingent expences,	115 12 9
To Orphan Press Bills, for Binding,	206 0 0
To Dufturces, for ditto,	206 3 0
To 12 copies, 1st vol. Journ. As. Soc.	144 0 0
To Museum Collection and Cabinets,	100 0 0
To Repairs of House,	77 13 9
To Orphan Press for printing 500 copies, 2nd part of the 18th vol. Asiatic Researches,	1,962 0 0
To engraving Maps and Plates,	316 8 0
To Experimental Boring,	500 0 0
To remitted to H. H. Wilson, Esq. £100, as Agent in England,	923 1 3

11,804 14 10

By Balance of Cash in hand, this day, 20 8 5

Sicca Rupees, 11,825 7 3

RECEIPTS.

By the Sale of Researches,	160 0 0
By Subscriptions collected,	3,904 0 0
By Interest on 7,500. Paper sold,	243 12 5
By Sale of Company's Paper,	7,429 10 11
By cash from Government for the Burmese Image Pedestal,	88 0 0

Sicca Rupees 11,825 7 3

Stock and Dependencies.

Company's paper deposited with the Government agency,	17,500 0 0
Interest for one year (not drawn),	700 0 0
Outstanding Quarterly Bills, recoverable,	4,206 0 0
Dividends on Macintosh & Co's Debt of 11,964. 6. 6.	

With regard to the collection of the quarterly contributions, the late unfortunate failures have necessarily caused much inconvenience both to the collector and to absent members, and to this cause may be attributed the apparently large amount on the defaulters' list. Still there are some names against which too large a balance appears to stand as due, and it is for the Society to determine, whether the members thus continuing in default are to be allowed the privilege of calling themselves

such, while the burden falls upon their more regular brethren. The contributions of eighty members (without entrance fees) would be 5120, whereas only 3900 were collected; and in this sum is included 302 rupees, from the Right Honorable the Governor General, the Patron of the Society, who, contrary to former precedents, has liberally directed that he should be charged as an ordinary paying member. The Society is aware that an endeavour has been made, though it is not yet matured, to introduce the option of compounding for the quarterly subscriptions, and I cannot but anticipate that this measure, if adopted, will prove more productive to our finances, and more convenient and agreeable to most of the members. It will also save the expence and delay of collection.

It has been my desire to lessen in some degree the burthen to paying members, by distributing the Journal gratis to them during the past year: the result has not proved so encouraging as I could have wished, but with some modification I hope still to be able to continue the measure.

Of the subscription for Mr. H. H. WILSON'S Bust, Rs. 1080 have been collected and remitted to that gentleman: no intimation has been yet received of the probable cost of the bust.

Although it has not been thought prudent to commence a new volume of Researches, or even the printing of the Index of the 18 volumes, sanctioned by the Committee of Papers, the press has not been idle, and I have the pleasure to lay on the table a copy just completed of M. CSOMA DE KOROS' Tibetan Dictionary, printed at the expence of Government, and under the auspices of the Society, as reported on the 20th Feb. last. M. CSOMA'S Grammar will now be put in hand, and the whole completed in the course of the present spring.

The plan of increasing the museum has remained uncompleted for the want of means, as the rooms on the ground-floor cannot be adapted to the purpose without terracing them anew and enclosing the arched openings to the north. Mr. PEARSON was induced to accept the office of gratuitous Curator in the month of July last, and an assistant curator had been brought on the strength of the establishment some months previously, who has been employed in cleaning and preserving the objects now in our cabinets. But it must be obvious that this branch of the Society cannot flourish, while those who might be expected to cherish and support it are constantly engaged in other duties and reside at too great a distance even to pay the rooms an occasional visit. One new cabinet has been constructed to receive a collection of shells arranged by Dr. PEARSON, and the geological almirahs have become nearly filled with contributions from various quarters.

With regard to the Library, it seems essentially necessary to incur some expence for the better preservation of the books, especially the valuable records of other Societies, presented periodically in paper covers. I beg to propose that some professional person be appointed binder to the Society, who may be entrusted with the binding of all new books on fixed rates, under the Committee of Papers.

The furash of the Museum, a very old man, who has been with the Society since its first establishment, has been allowed to retire on a trifling pension without causing any additional charge to the establishment.

We have to deplore the loss of two Members, by death, during the past year, one of them, Captain HERBERT, is so well known by the high services he has rendered to science in India, that the tribute of an obituary testimony to his memory becomes

his due, and I have only to regret that I am not yet provided with the materials for a sketch of his short but eminently useful career.

By departure to Europe, our loss of members has been still more severe, but it may be hardly fair to consider that a deprivation which but changes the scene and sphere of their exertions and utility.

I have purposely refrained from alluding to the labours of a more exalted nature, which have brightened the proceedings of the past year, because I consider it to be the privilege of the highest officer of the Society to review the objects and progressive success of the institution over which he presides. Severe indisposition has unfortunately placed it out of the power of our President to restore the laudable custom of an annual address on the present occasion ; which is the more to be regretted, as this is the jubilee anniversary of the day on which the illustrious founder of the Society was elected its first President. The close of that eventful period finds the parent Society shorn of all its exclusive honors, and forming but one, perhaps the humblest, of the numerous bodies associated in Europe and in India, for the prosecution of "inquiries into the history, antiquities, the natural productions, arts, sciences, and literature of Asia." The tree which was auspiciously planted by the great Sir WILLIAM JONES, to use his own expression, has long since produced its fairest blossoms, and its most exquisite fruit. It has spread its roots in distant lands, where the arts of cultivation are better understood, and the value of its produce can be more skilfully developed ; but we must not forget that we here assemble under the shade of the original tree, and that however decayed the parent stock may have become, while its more vigorous branches are taking root in France, Germany, and England,—still it is to the Asiatic Society of Bengal that belongs with propriety the motto assumed by one of its illustrious scions, "*Quot rami tot arbores.*"

Library.

The following books were presented :

Transactions of the Royal Asiatic Society, 2nd part of the 3rd volume, new series, and the Proceedings of the 10th Annual Meeting of the Society, with the Reports of the Council, Auditors, and Committee of Correspondence, held on Saturday, May 11th, 1833.—*By the Society.*

Proceedings of the Geological Society, Nos. 30 and 31, with a list of its members for 1833.—*By the Society.*

Garcin De Tassy, Appendice aux Rudimens de la Langue Hindoustani.—*By the Author.*

Marcoz, Errcur des Astronomes et des Geometres.—*By the Author.*

Journal Asiatique, Nos. 59 and 66.—*By the Asiatic Society of Paris.*

Journal of Medical Science, No. 1, vol. 1st.—*By Messrs. J. Grant, and J. T. Pearson, Editors.*

Meteorological Register for December, 1833.—*By the Surveyor General.*

The following works received from the Oriental Translation Fund of Great Britain and Ireland.

No. 414, Atkinson's Customs and Manners of the Women in Persia, and their domestic superstitions :

Shea's Translation of Mirkhond's History of the early Kings of Persia.

Travels of Macarius, parts 3rd and 4th, translated by F. C. Balfour.

The following books, received from the book-sellers :

Heeren's, Asiatic Nations, 3 vols.

Rosen, Corporis Radicum Sanscritum Prolusio, 1 vol. P.

———— Radices Sanscritæ, 1 vol.

———— Rig Vedæ Specimen, 1 vol.

Freytag, Arabischen Verskunst, 1 vol.

———— Dictionary Arabico-Latinum, 1st and 2nd vols.

Kosegarten, Chrestomathia Arabica, 1 vol.

Benary, Nalodaya Sanscritum carmen, 1 vol.

Bohlien, Carmen Arabicum Amali dictum, 1 vol. P,

Jernour's Treatise on Languages, 1 vol.

Tyerman and Bennet's voyages and travels, 2 vols.

Prichard's Celtic Nations, 1 vol.

Upham's Sacred and Historical books of Ceylon, 3 vols.

Malcolm on the Government of India, 1 vol.

Brydges Dynasty of the Kajars, 1 vol.

Fairholme's Geology of Scripture, 1 vol.

Historical Sketch of Sanscrit Literature, 1 vol.

Alison's Physiology and Pathology, 1 vol.

David's Turkish Grammar, 1 vol.

British India, 3 vols.

Lardner's Cabinet Cyclopaedia, middle ages, 1 vol.

Wilken's Mohammedi Filii Chondschahi, vulgo Mirchondi Historia Gasnevidarum, 1 vol.

Lassen, Gymnosophista, 1 vol. P.

Physical.

Anative *talwâr*, and three water-fowls, from Assam, were presented by Dr. BURLINI.

Read, a letter from G. A. BUSHBY, Esq. Secretary to Government, communicating an account of the boring experiment lately conducted by Captain GRANT in Cutch. [Printed in the present number.]

Read extracts from the Third Annual Report of the Society of the Natural History at the Mauritius, presented by M. JUL. DESJARDINS. Secretaire et Membre Fondateur, dated 24th August, 1832.

Read a note from Captain JENKINS, forwarding specimens of a rich ore of mammellated and stalactitic manganese, found in the Ajmîr mines; and also of shot manufactured on the spot by Captain DIXON from the Ajmîr lead.

Read a letter from Colonel WATSON, presenting further specimens of coal, iron, and other productions of the Kasya hills.

Read a note from Ensign NEWBOLD, forwarding the specimens of granity, gold dust, and plants referred to in his account of an excursion to the summit of Mount Ophir in the Malay peninsula.

[See a note by Dr. WALLICH on the plants, inserted in the present No.]

Read a letter from Captain P. T. CAUTLEY, Superintendant of the Doab Canal, announcing his discovery of the remains of an ancient city underground, in the neighbourhood of Seharanpur, and presenting two silver and 24 copper coins found there, and a fragment of bone.

[This announcement is printed in the present number.]

Submitted, an essay on the land and fresh water shells of India, by Lieutenant T. HUTTON, accompanied with specimens of the same.

[This will be published in our next.]

Submitted, a note by Lieutenant Colonel HONGSON on the use of glass for the balance wheels of chronometers, accompanying a pamphlet on the subject, by ARNOLD and DENT, presented by the same member.

XIII.—*Miscellaneous.*

1.—*Correction of an Error in Gregory's Mathematics.*

As Gregory's *Mathematics* is generally used as a book of reference you would be the means of saving many from error by correcting in the *Journal of Asiatic Society*, the following misprint at page 297. T.

$$\text{For } V = \frac{307 \sqrt{(R - \frac{1}{16})}}{S^{\frac{1}{2}} - \frac{1}{2} \log. (S + \frac{1}{16})} - \frac{1}{16} \sqrt{(R - \frac{1}{16})}.$$

$$\text{Read } V = \frac{307 (\sqrt{R - \frac{1}{16}})}{S^{\frac{1}{2}} - \frac{1}{2} \log. (S + \frac{1}{16})} - \frac{1}{16} (\sqrt{R - \frac{1}{16}}).$$

2.—*Tufa Formations in Persia.*

Having procured a party of horsemen, we proceeded over some very rugged ground, five miles in an E. S. E. direction, when we came to the ruins of the palace erected by Suliman, one of the first khalifs of Bagdad. It is a fine quadrangular structure, built round a natural basin of 70 yards in diameter, and presenting one of the most singular phenomena in nature. A small channel, of four inches wide and three deep, carries off the superfluous water, which appears to be considerably agitated by a strong spring; on a nearer approach this is found to be occasioned like the smaller one of Yakout Buttak, by gas, which is only confined by the body of water through which it forces its way. The water flowing from this fine reservoir forms small pools outside the gates, and a deposit of tufa immediately takes place, of which the whole hill is composed, and has most probably been formed in a similar manner, though it has now reached a height of 300 feet. The water appears to occupy a greater space below than above, but all the line I could procure (400 feet) was insufficient to find a bottom, either at the side or centre, where I was able to go on a raft. The whole of the mountains about appear to be of a similar formation, and the brooks are almost filled up by large masses of light porous tufa. Madrepore is also abundant. The place is highly ornamented in the arabesque manner, and has been one of the best modern buildings in Persia. To the north, on the top of one of the highest peaks of Balkas, stands a strong castle, with four towers, and about 100 yards of a side. I could not ascertain to what era it belonged, but imagine it was far anterior to Muhammedanism, and probably was a fire temple of the later period. It had no Arabic inscriptions, which every where cover the walls of the lower building. After a minute survey of the palace, and getting some of the Arabic inscriptions copied, which were only verses from the Koran, or moral sentences, I proceeded to a remarkable peaked hill, about two miles to the south-west, called the *zendan*, or prison. With con-

siderable difficulty we scrambled up to the top of the hill, which is higher and steeper than the former, but of a similar formation. On reaching the top, I found an immense hollow of the same irregular form, with signs of water having been considerably agitated against its sides; but in other respects exactly resembling the crater of a volcano. The eye could not reach the bottom, so that I could not ascertain if there was still water; the diameter of this was considerably less (perhaps forty feet). We descended with even more difficulty than we had clambered up, and commenced a strict search round the base, to ascertain if water had ever forced its way through the mass of rock. On the western side the hill appeared to be less compact than in other places, and a considerable channel, in which there is now no water, has been washed away apparently by a rapid current. I therefore think it not impossible that this hill, like the former, had once been the same kind of basin, gradually formed by a deposit of the water, which, at last, on reaching a height beyond which the sides were unable to resist its pressure, found a passage through the lower part. Whether this is the case or not, I leave to the decision of more able geologists than myself; but the fact is undoubted, that this mass of mountains in the neighbourhood, 7500 feet high, appears to its very summit to be composed of the same light deposit. In the south-west extremity are extensive mines of sulphur, and a white substance was shown me, which they used in their sherbet, of a pleasant acid taste: they praised it as being an excellent tonic.—*Monteith's Tour; Jour. Geog. Soc.* iii. 7.

3.—*Gigantic Natural Arch.*

At the seventeenth mile we reached the town of Makoo, and its gigantic cavern. The whole party were struck with amazement, and instinctively halted, not able to trust our eyes as to the reality of the scene before us. A vast arch, 600 feet high, 1200 feet in span, and 20 feet thick at the top, at once presented itself to our view. This cavern is 800 feet deep, but, as the sun then shone directly in, the height and breadth alone attracted our attention. At the very bottom of this is a castle inhabited by a chief of the tribe of Biant; and at the junction of the limestone and lava a number of small caves have been partially excavated, accessible only by a ladder. From one of these a small stream of water trickles down the rock, but the artificial works look, in the vast space of this natural excavation, like ants' nests on a wall. It appears to me that this could only have been formed at the time of some great convulsion of nature. From the breadth of the sheets of lava, I do not think they came from any volcano, but by the sudden rise of a great extent of country. Had a number of small volcanoes at any time existed, the meaning of Azerdibijan (country of fire) applied to the whole province, could not be doubtful. The chief was jealous of a close examination of his fortress, and though a ladder, for which I applied, to examine an inscription at the western side, was promised, it never came. From the ground I could see that the writing was neither Arabic nor Armenian, and had some appearance of Greek or Roman characters. The place is a modern structure, but the upper caves have always been in use as places of refuge. There are about 400 houses in the town: some few stand under the rock, but as masses of stone have frequently fallen, the generalities are outside, and protected by a low wall; they could easily be destroyed from the top of the rock.—*Monteith's Tour.*

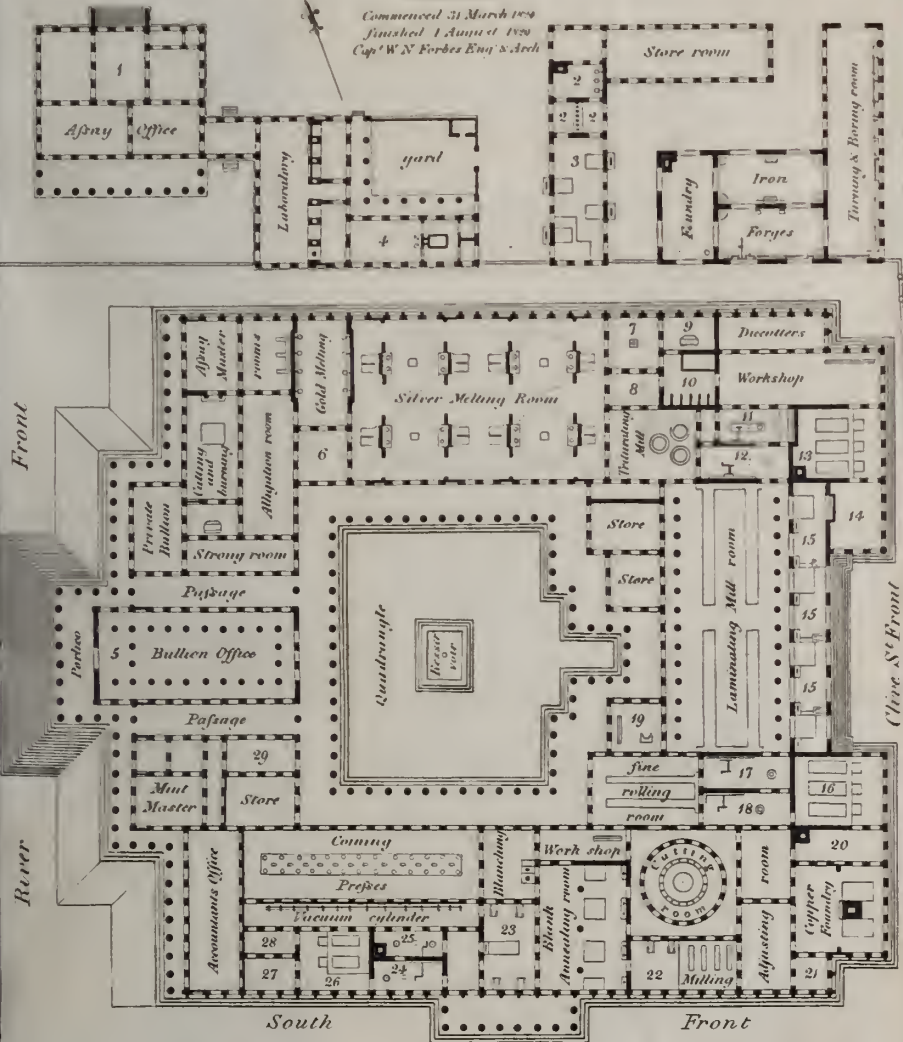
Meteorological Register, kept at the Assay Office, Calcutta, for the month of January, 1834.

Day of the Month	Barometer reduced to 32° Fahr.				Thermometer in the Air.				Depression of Moist-bulb Thermometer.				Hair Hygrometer.		Rain.	Wind.		Weather.		
	At 4 A.M.	At 10 A.M.	At 4 P. M.	At 10 P. M.	Minimum at 4 A. M.	At 10 A. M.	Max. by Reg. Ther.	At 4 P. M.	At 10 P. M.	At 4 A. M.	At 10 A. M.	At 4 P. M.	At 10 P. M.	Inches.		Morning.	Noon.	Evening.		
1	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		clear.	clear.	clear.	clear.	clear.	
2	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
3	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
4	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
5	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
6	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
7	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
8	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
9	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
10	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
11	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
12	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
13	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
14	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
15	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
16	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
17	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
18	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
19	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
20	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
21	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
22	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
23	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
24	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
25	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
26	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
27	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
28	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
29	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
30	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
31	29.9	29.950	29.97	29.91	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8		do	do	do	do	do	
Mean	29.935	29.935	29.935	29.935	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	0.20	clear and cold.	clear and cold.	clear and cold.	clear and cold.	clear and cold.	

The instruments are the same, and similarly situated, as in 1833. A standard Thermometer by Newman has been received from England, and found to correspond to the tenth of a degree with the instrument registered by me since, 1824. A standard Barometer compared with the Barometer at Somerset House is shortly expected. J.P.

GROUND PLAN of the NEW MINT Calcutta

Commenced 31 March 1829
Finished 1 August 1829
Capt W N Forbes Eng & Arch



Reservoir for Engines



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For use in Library only

